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Working Party on Inland Water Transport

Sixty-first session
Geneva, 4-6 October 2017
Agenda Item 6 (b)
Standardization of technical and safety requirements in inland navigation: Signs and Signals on Inland Waterways (SIGNI) (Resolution No. 22, revision 2)

Revision of the Signs and Signals on Inland Waterways (SIGNI) (Resolution No. 22, revision 2)

Note of the secretariat

Mandate

1. This document is submitted in line with cluster 5: Inland Waterway Transport, para. 5.1 of the programme of work 2016-2017 (ECE/TRANS/2016/28/Add.1) adopted by the Inland Transport Committee at its seventy-eighth session on 26 February 2016.

2. At its sixtieth session, the Working Party on Inland Water Transport (SC.3) decided to start revision of the Signs and Signals on Inland Waterways (SIGNI) (Resolution No. 22, revision 2) and, in particular, to combine Resolution No. 59 and SIGNI into a single document under the title "SIGNI" to avoid overlaps (ECE/TRANS/SC.3/203, para. 63).

3. The Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation (SC.3/WP.3) at its fiftieth and fifty-first sessions approved the new structure and amendments to SIGNI and took note of the draft proposal for the third revision of SIGNI (Informal document SC.3/WP.3 No. 10 (2017)). The secretariat was asked to prepare a final version amended according to the proposals of the twenty-fifth meeting of the CEVNI Expert Group and with Chapter 12 for the sixty-first session of SC.3 (ECE/TRANS/SC.3/WP.3/102, para. 32).

4. Annexes I and II to this document contain a draft resolution to replace Resolution No. 22 and the draft revised text of SIGNI amended according to the decisions of SC.3/WP.3. SC.3 may wish to consider and adopt it as Resolution No. 88.

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Annex I

Draft Resolution

Resolution No. ...
(adopted by the Working Party on Inland Water Transport on ...)

The Working Party on Inland Water Transport,

Considering its Resolution No. 22, concerning SIGNI: Signs and Signals on Inland Waterways, as amended by Resolutions Nos. 29, 51 and 67 (ECE/TRANS/SC.3/108/Rev.2),

Considering also its Resolution No. 59, containing in its annex the Guidelines for Waterway Signs and Marking, as amended by Resolutions Nos. 75 and 85 (ECE/TRANS/SC.3/169/Rev. 2),

Considering further its Resolution No. 24, concerning the European Code for Inland Waterways (CEVNI), as amended by Resolutions Nos. 26, 27, 37, 39, 43-47, 54, 62, 66 and 81 (ECE/TRANS/SC.3/115/Rev.5),

Desirous, in the interest of safety of navigation, of establishing homogeneous rules for waterway signs and marking prescribed by CEVNI and SIGNI as well as for their visibility, installation and visualization,

Acknowledging the desirability, for the safety of navigation, of maintaining a system of signs and signals on inland waterways harmonized with the maritime system of buoyage,

Bearing in mind the report of the Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation on its fifty-first session (ECE/TRANS/SC.3/WP.3/102, paragraphs 30-32),

1. Adopts the European Code for Signs and Signals on Inland Waterways, the text of which is contained in the annex to this resolution,

2. *Decides* to cancel Resolution No. 22, revision 2, Resolution No. 59, revision 2, as well as Resolutions Nos. 29, 51, 67, 75 and 85 which are replaced by this resolution,

3. *Invites* Governments and River Commissions to inform the Executive Secretary of the United Nations Economic Commission for Europe whether they accept this resolution,

4. *Requests* the Executive Secretary of the United Nations Economic Commission for Europe to place the question of the application of this resolution periodically on the agenda of the Working Party on Inland Water Transport.

Annex II

Annex to Resolution No. ...
European Code for Signs and Signals on Inland Waterways (SIGNI)

1 General

1.1 General principles

1.1.1 In terms of the objective pursued, the marking comprises three categories of buoyage and marking:

(a) Buoyage of fairway limits in the waterway by means of buoys or spars, hereafter floating signs. This category will normally be used only on sections of waterway where the fairway cannot be indicated sufficiently clearly by marks placed on the banks;

(b) Buoyage and marking of danger points and obstacles, i.e. navigational hazards including:

- danger points, e.g. campshot, projections of the bank, low banks liable to flooding, fixed obstacles;
- obstacles, e.g. grounded or sunken vessels or floating equipment; work sites in the waterway, lost anchors, structures protruding into the fairway or in its vicinity etc.;

(c) Marks on land indicating the position of the fairway, hereafter bank marks, indicating the position of the fairway in relation to the banks and, where appropriate, its crossover from one bank to the other. The marks may also be used to provide isolated reference points for boatmasters.

1.1.2 Signs and signals comprise:

(a) Signs used to regulate navigation on the waterway, set out in Section 3.5, Chapter 5 and Appendix 1, as well as annex 7 of the European code for inland waterways (CEVNI); and

(b) Floating signs and bank marks, set out in Chapter 3 and annex 8 of CEVNI.

1.1.3 The signs set out in annex 7 to CEVNI are prohibitory, mandatory, restrictive, recommendatory or informative signs and auxiliary signs.

1.1.4 In the case of lakes and broad waterways, the three categories of buoyage and marking referred to above are used. In addition, special provisions are prescribed under Chapter 4.

1.1.5 In accordance with article 5.01 of CEVNI, vessels' crew members shall obey the requirements and take account of the recommendations or indications brought to their attention by these signs.

1.1.6 The number of signs, bank marks floating signs and their on-site locations shall meet the requirements of navigation safety.

1.1.7 In order to increase navigation safety, the competent authorities shall place kilometre markings along the inland waterway wherever waterway dimensions allow, as well as mark of each hectometre wherever possible.

1.1.8 Where the competent authorities decide to install a system of marking on a particular waterway or inland navigation network, they may:

- Select from among the marks covered by these provisions those which they deem suitable for the waterway or waterway network in question;
- Supplement the marks selected with additional marks not included in the system defined below, provided always that the shape and colour of such marks and the nature of any symbol employed are consistent with the system and are such that the additional marks cannot be confused with any of the system's existing marks.

In cases where these provisions permit alternatives, the competent authorities shall, unless there are overriding reasons to the contrary, agree on the alternative to be adopted on all of the several parts of the same waterway.

1.1.9 The choice of the marks and the establishment of their number depend on the local characteristics of the fairway and the function of each mark. Their installation shall be effected in cases when it is required by navigation criteria on the respective river section, in such a way as to ensure visibility from one mark to the next.

1.1.10 The term "left and right banks" means the sides of the waterway when moving from the source to the mouth.

On canals, lakes and broad waterways the competent authorities shall decide the matter in the light of local conditions. However, it is recommended that for canals the terms "right" and "left" should be defined as meaning to the right and to the left respectively of an observer facing in the direction in which the numbers indicated on successive kilometer markings rise.

1.1.11 The designations "right-hand side" and the "left-hand side" of the waterway or fairway are to be understood as for an observer facing downstream. On canals, lakes and broad waterways, the terms "right-hand side" and the "left-hand side" shall be defined by the competent authorities.

1.1.12 Aid to Navigation (AtoN) means a device, system, or service, external to a vessel, designed and operated to enhance safe and efficient navigation of all vessels and/or vessel traffic.

1.1.13 Where the prescribed mark consists of:

(a) Lights only: the lights may be used both by day and by night;

(b) Boards only: the boards may be used as night marks if illuminated;

(c) Boards and lights: by day, either boards or lights may be used; by night, either lights or illuminated boards may be used.

1.1.14 The marks shall be installed by the competent authorities which:

(a) Regularly observe the state of the river bed and the changes taking place in it and, on the basis of the results of these observations, correct the positioning of the signs and marks and, where necessary, add to them so that they indicate the fairway dimensions;

(b) Regularly measure the depth and the width of the marked fairway and provide boatmasters with the necessary information concerning minimum fairway depths and widths and the river level regime;

(c) Establish the plan for the installation of signs and marks (hereinafter the marking plan) in their respective sectors and establish the type and number of floating signs and bank marks to be used, in terms of the requirements of navigational safety and local conditions;

(d) Ensure as far as possible the uninterrupted operation of all floating signs-and bank marks;

(e) Inform boatmasters in good time of the date of the installation and removal of signs, of all alterations of importance to navigation to their number, type, positioning and lighting, and the rules they establish permitting the passage of vessels in restricted sections where meeting and passing are prohibited.

1.1.15 The numbering of the sketches of signal signs and marks including lights corresponds to numbering given in annexes 7 and 8 of CEVNI.

1.2 Lights

1.2.1 For the purpose of SIGNI and CEVNI, the following definitions are used:

- "Light": a distinctive light used as a marking.
- "Fixed light": an uninterrupted light of constant intensity and colour.
- "Rhythmic light": a light of constant intensity and colour operating in a characteristic and regularly repeated succession of spells of illumination and extinction.

1.2.2 In principle, the use of rhythmic lights shall be reserved for the marking of the waterway. Rhythmic lights are described in Appendix 4. Rhythmic lights shall also be used under the conditions specified in Section 5.3.

1.2.3 In principle, the use of fixed lights shall be reserved for purposes other than those referred to in 1.2.2. For the meanings of the fixed lights recommended, see 5.2.2.

1.2.4 The luminous intensity of lights is established by the competent authorities-in terms of local navigational conditions. In classifying the luminous intensity, it is recommended to use the classification of luminous intensity in Appendix 2, which also includes calculations for luminous range.

1.2.5 In principle, the colours of lights should be in keeping with the standard of the International Commission on Illumination (CIE) ("Colours of Light Signals", CIE S 004/ E-2001, class A).

1.3 Boards and buoys

1.3.1 Boards bearing special signs recommended are all rectangular.

They are divided into two categories according to the signs they bear:

(a) Signs giving instructions: these shall be coloured white and bordered in red and display black symbols. Where they indicate a prohibition, the boards shall also bear a diagonal red bar;

(b) Signs giving information or indicating the end of an instruction for vessels proceeding in one direction only: all boards shall be rectangular and blue in colour, with white symbols.

1.3.2 The visibility of the boards may be improved by a narrow white border.

1.3.3 If necessary, these signs may be supplemented by additional boards, indicator plates, inscriptions referred to in 3.5.2 or additional luminous signals referred to in 5.4.

1.3.4 The chromaticity of the surface coatings of buoys and boards should lie within the chromaticity areas defined in the recommendations on the surface colours of visual signs and signals published by CIE (see 1.2.5). The back of the panel, if visible from the navigable zone, shall be of such a colour as not to be misleading.

1.4 Lighting

1.4.1 In certain cases lighting may be provided at night (e.g. lighting or the lower part of a bridge, of the piers of a bridge, of the approaches to a lock, of a section of a canal, etc.). Such lighting may be used to supplement the marks.

1.4.2 Lighting shall be so designed as to avoid dazzle.

1.5 Geographical limits of applicability of the marking system recommended

1.5.1 The competent authorities shall if necessary determine the boundaries between inland waterways (to which the recommended marking system applies) and maritime waterways.

1.5.2 The principles of the Aids to Navigation system of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) have been taken, where applicable to inland waterways, as the basis for the following provisions. These provisions have been defined in such a way as to avoid, as far as possible, any risk of conflict or confusion between the two systems of buoyage.

2 Visibility of signs and lights

2.1 General provisions

2.1.1 Whatever the position of the vessel in relation to the sign or the marker light, the characteristics of the sign or light shall remain unchanged. For daytime signs, these characteristics are: the form (topmark) and the colour; for signs at night: the type and colour of the lights.

2.1.2 The forms and the colours of the topmarks and the types and colours of the lights are set out in detail in Sections 3.2-3.4 and their minimal dimensions are set out in Appendix 1.

2.1.3 The basic requirement to be met by signs and marking is the guarantee of good visibility of all signs and lights by day or night.

2.1.4 In accordance with the recommendations of IALA,[1] there are three degrees of visibility of signs:

(a) First: the sign is visible to the naked eye. The meaning of the sign is not yet identifiable (simply visible);

(b) Second: when the sign is clearly visible and identifiable according to the present SIGNI and in CEVNI (identifiable);

(c) Third: the sign is identifiable and distinguishable from its surrounding background (conspicuous).

Signs that must be seen by a boatmaster at some imperative distance ("no entry", "keep a particular sharp lookout", etc.) must have a visibility (due to their proper dimensions) of second or third degree. The type and dimensions of signs should be selected accordingly.

Third degree visibility is required when the sign or light is identifiable in principle, but cannot be easily seen at night owing to the surrounding background (presence of construction or a large number of light sources).

[1] IALA Guideline No. 1094 — On Daymarks for Aids to Navigation, Edition 1, December 2012.

2.1.5 The degree of visibility of signs and lights depends on the following conditions:

- Signs:
  - Angle of sight;
  - Colour contrast and differences;
  - Lighting (including natural day light) and weather conditions.
- Lights:
  - Luminous intensity;
  - Competing lights and background lighting;
  - Weather conditions.

2.2 Conditions of visibility and dimensions of signs

2.2.1 In order to ensure the first degree visibility, in daytime the sign shall be visible with an angle of more than 1 angular minute and with sufficient contrast in relation to the environment. Detailed form and colour of the sign (second and third degree visibility) can only be distinguished with a larger angle of sight or with a reduction in the distance L to the object being observed.

2.2.2 The minimal angle of distinction in daytime for simple shapes (cylinder, cone, sphere, etc.) is between 3 and 5 angular minutes, and for complex shapes (numbers, letters, etc.) between 5 and 8 angular minutes. For the boatmaster to be able to recognize the daymark (without any optical aids) at appropriate distances and visibility, the following formula can be used for the calculation of the required-minimum dimensions of simple and complex shapes (see fig. 2.1):

$$H = L \cdot \mathrm{tg}\,\alpha \cong L \cdot \sin\alpha$$

where:

H (m) — height of the sign;

L (m) — distance;

α (') — viewing angle.

(fig. 2.1)

Values for H (m) as a function of L (m) and α (') are presented in table 2.1.

Table 2.1

		L				
	α	*500*	*1 000*	*2 000*	*3 000*	*4 000*
For signs of simple shapes (cylinder, cone, circle, etc.)	3	0.44	0.87	1.74	2.61	2.48
	4	0.58	1.16	2.32	3.48	4.64
	5	0.73	1.45	2.90	4.35	5.80

Table 2.1 shows that a shape of a sign with dimension H = 0.5 m is recognizable at distance L = 500 m and viewing angle α = 4°; when L = 1,000 m, then H = 1 m, etc.

When there are simple drawings (dot, line, arrow) on the signs, a 15 per cent visibility reduction must be taken into account, while with complex drawings it shall be 30 per cent.

2.2.3 Examples of the minimum measurements for the signs, marks and buoys from Sections 3.2-3.5 as well as annexes 7 and 8 to CEVNI are given in Appendix 1. Alphanumeric characters on signs should intend to provide a standard for the various signs.

The letters, figures and analogous symbols should be of a height not less than one five-hundredth of the maximum distance from which they must be read, and the thickness of the stroke should be not less than one-seventh of that height.

For bank marks and signs, the minimal height from the lower rim of the board down to the base of the lowest sign shall be 3 m. In places where it is necessary due to the configuration of the terrain (relief), a height of 2 m is allowed. At highest navigation water levels, the height between the water surface and the lower rim of the board of the lowest sign should not be less than 1.5 m.[2]

2.2.4 As regards the signs and signals of Sections 3.2-3.5 as well as of annex 8 to CEVNI, unlighted buoys and unlighted bank mark boards shall be covered with reflective material. Light buoys and lighted bank mark boards may also be so covered. The colours of these materials shall correspond to those established for the buoy lights or the boards. In all cases, the topmarks of light buoys shall be covered with reflective paint.

2.2.5 In order to ensure that bank marks are clearly visible, their dimensions shall be determined in terms of their purpose, the distance between the fairway and the banks, the nature of the region and the characteristics or other specific conditions of the sector in question.

2.2.6 The good visibility of a sign or signal depends on the contrast between the luminance of the sign or signal and the background. This shall be taken into consideration in choosing a site for signs. For example, of two boards, one red and the other white positioned one beside the other against a light background, the red board will be more visible and visible at a greater distance than the white board while, in contrast, the white board will be easier to see than the red board against a dark background.

2.2.7 The visibility of signs in Appendix 1 as well as annex 7 to CEVNI regulating navigation on the waterway shall be ensured at night by lighting them with fixed directional

[2] If this requirement cannot be met due to local conditions, the competent authorities may prescribe other requirements to ensure proper visibility.

white lights, operating uninterruptedly and so positioned that the light does not incommode the boatmasters.[3]

If electric lighting cannot be used, the sign boards shall be covered with reflective material of a corresponding colour on which the symbol shall be clearly visible to vessels.

2.2.8 In order to guarantee the visibility of lighted boards, the back lighting must conform with the provisions of Appendix 5, where, in addition to luminance and its regularity, the colour for the white light source is established to ensure that colours under artificial light look the same as when seen in daylight.

For reliable identification at night the surface of the sign must be smooth and even, and if possible reflective.

2.3 Conditions for the visibility of lights

2.3.1 In certain cases, lighting may be provided at night (e.g. lighting of the lower part of a bridge, of the piers of a bridge, of the approaches to a lock, of a section of a canal, etc.). Such lighting may be used to supplement the markings. Lighting shall be so designed as to avoid dazzling.

2.3.2 Luminous intensity is broken down into three categories in terms of navigation lights for inland waterway vessels (see Appendix 2).[4]

2.3.3 Light signals are identified according to their characteristics. The characteristics are given by their colour and the rhythmicity of the light source in accordance with Chapter 5 and Appendices 2 and 4.

2.4 Obligation not to hinder road and rail traffic

2.4.1 Signs and marking shall be installed in such a way that their lights do not hinder the movements of other modes of transport if the road runs close to the river.

2.4.2 In a sector in which a road or a railway runs close to a river, the installation of all the above-mentioned signs and signals shall be carried out in consultation with the respective competent authorities.

3. Buoyage and marking of the waterway

3.1 Requirements to be met by signs and marks and their marking plan

3.1.1 The marking shall be in operation continuously (by day and by night) all along the navigable section of the river, and, as far as possible, as from when the waterway is free from ice until the ice appears; it shall be corrected as changes occur in the water level and in the fairway.

In accordance with the state of the fairway, the marking shall be positioned in such a way that the vessels navigating downstream can use the part of the river with the high current speed and the vessels navigating upstream can use the part of the river with the low current speed.

3.1.2 During periods of high water and icing, the regular floating signs removed to preserve it from possible damage shall be replaced, as far as possible, by marker posts and

[3] The competent authorities may waive these requirements.

[4] The alternative proposal is to refer to IALA Recommendations E-200 on Marine Signal Lights.

spars, the topmarks and colours of which shall correspond to those adopted for the respective side of the fairway.

3.1.3 Floating signs shall be installed so as to ensure the safety of vessels on the fairway. Floating signs are anchored at approximately 5 m distance from the limits that they indicate.

3.1.4 Groynes and shallows can be marked using fixed marks or buoys. These marks or buoys are usually placed on the borders of groynes and shallows or in front of them.

3.1.5 Buoys shall be unsinkable and shall remain unsinkable in all storms, and their main body shall therefore be watertight; they shall not only float but also be stable, i.e. conserve a vertical position as far as possible and not be tipped excessively by waves and wind.

3.1.6 The basic condition which the marking plan shall meet is to ensure the safety of the vessels and the continuity of traffic, by day and by night, throughout the sailing season and to give boatmasters clear and unambiguous indications concerning the direction and the limits of the fairway.

3.1.7 The marking plan shall be prepared in such a way as to permit a rational combination of bank marks and floating signs. When the plan is drawn up, it should be based on the conditions of navigation and specific hydrographic and hydro-meteorological conditions, the need to ensure the established dimensions of the fairway and create the necessary conditions for the safety and continuity of navigation of all river vessels and, where necessary, of seagoing vessels.

3.1.8 Bank marks serve to guide boatmasters and to indicate the direction of the fairway. Floating signs supplement bank marks in sectors where, in order to ensure the safety of navigation, it is essential to indicate not only the direction of the fairway but also its limits, and to mark places where there are obstacles.

3.1.9 In preparing the marking plan, the following requirements should be taken into account:

(a) Only the signs set out in Sections 3.2-3.5, as well as annexes 7 and 8 to CEVNI are to be used to mark the fairway and regulate navigation; in exceptional cases, special additional bank marks may also be used, provided, however, that the marks are not in contradiction with those contained in CEVNI;

(b) The dimensions of the marked fairway shall correspond to the dimensions published by the competent authorities;

(c) The choice of where the signs are to be placed shall be based on the most recent measurements, acquired experience and available data on the state of the fairway, critical points, water levels, etc.;

(d) Signs and marker lights shall be visible, whatever the level of the water, at all points of the fairway and as long as may be necessary for the guidance of boatmasters;

(e) The marking plan shall contain information on the type of placed signs, bank/side whereon placed, river kilometre of the set-up and recapitulation of all floating signs and bank marks used for marking.

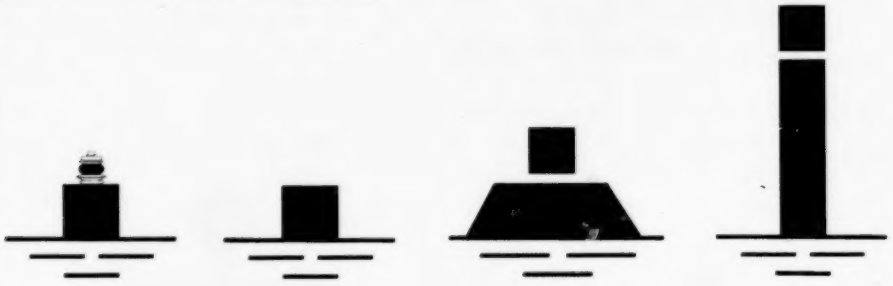
3.1.10 If there is a subsequent drop in the level of the water, reconnaissance soundings shall be taken on some sections of the river in order to check whether the positioning of the signs is adequate and to establish whether the marking needs to be supplemented by new signs.

3.1.11 The frequency of these soundings shall be determined by changes in water level. The more rapid the drop in levels, the more frequent the soundings need to be.

3.1.12 Examples of the application of the signs are given in figs. 3.10, 3.11 and in Chapter 6.

3.2 Buoyage of fairway limits in the waterway

3.2.1 Right-hand side of the fairway



1.A Buoy with light 1.B Buoy without light 1.C Float with a topmark 1.D Spar

(fig. 3.1)

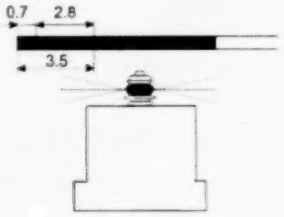
Colour: red

Form: cylindrical buoy or buoy with a topmark, or spar

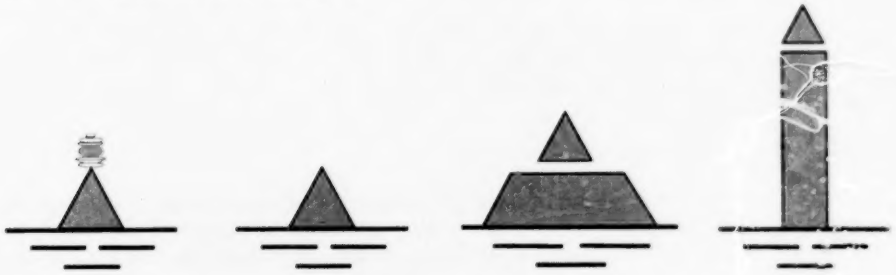
Topmark (if any): red cylinder

Light (when fitted): rhythmic red light

Generally with radar reflector



3.2.2 Left-hand side of the fairway



2.A Buoy with light 2.B Buoy without light 2.C Float with a topmark 2.D Spar

(fig. 3.2)

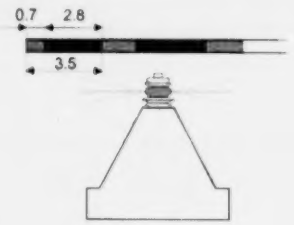
Colour: green

Form: conical buoy or buoy with a topmark, or spar

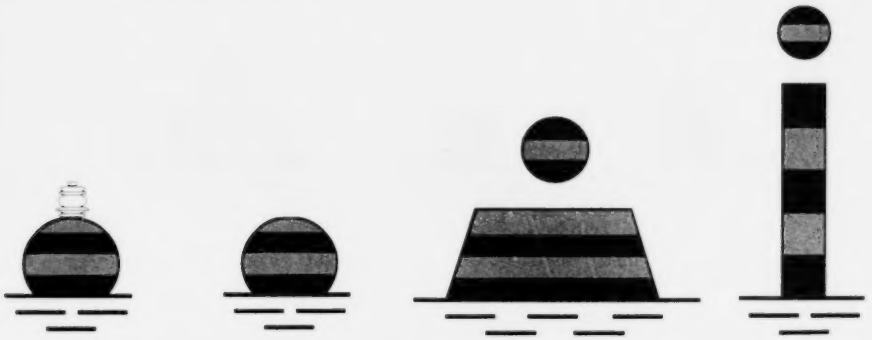
Topmark (if any): green cone, point upwards

Light (when fitted): rhythmic green light

Generally with radar reflector



3.2.3 Bifurcation of the fairway



3.A Buoy with light 3.B Buoy without light 3.C Float with a topmark 3.D Spar

(fig. 3.3)

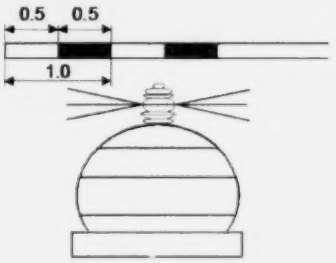
Colour: horizontal red and green bands

Form: spherical buoy or buoy with a topmark, or spar

Topmark (if any): sphere with horizontal red and green bands

Light (when fitted): continuous scintillating white light, or isophase white light (may be group-flashing white light with a group of three flashes)

Generally with radar reflector

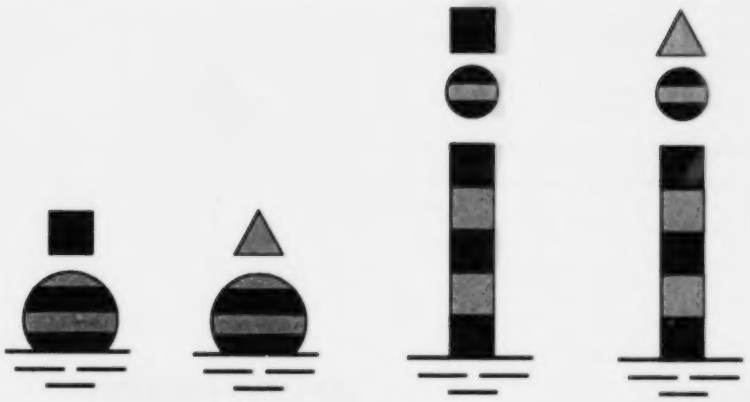


Where there is a risk of confusion with maritime signs and signals or with signs and signals for lakes and broad waterways as defined in Chapter 4, the above-mentioned rhythm of light shall not be used and shall be replaced by the group-flashing rhythm (group of three flashes).

When a bifurcation mark is used on lakes and broad waterways, care should be taken to avoid any risk of confusion with the marks provided for in Chapter 4.

Where necessary, a red cylindrical topmark or green conical topmark placed above the bifurcation mark indicates on which side it is preferable to pass (main fairway).

The mark shall then bear a rhythmic red light or a rhythmic green light, as appropriate.



3.E 3.E1 3.F 3.F1

(fig. 3.4)

3.2.4 A letter "P" painted in white on the buoys described in paras. 3.2.1 and 3.2.2 indicates that the fairway is adjacent to a berthing area. If the buoys showing the letter "P" carry a light, its rhythm shall be different from that of the lights of other buoys placed along the fairway limit.

3.2.5 The buoyage described above may not be used for the fairways and special zones referred to in Chapter 10.

3.3 Buoyage and marking of danger points and obstacles

3.3.1 Where it is desired merely to draw attention to an obstacle or danger point without requiring vessels under way to move in a particular direction, the following may be used:

(a) For obstacles and danger points in the fairway: the buoys, spars, topmarks and lights prescribed in Section 3.2 for marking the fairway limits.

(b) For obstacles and danger points outside the fairway, either fixed marks (see 3.3.2) or buoys (see 3.3.3) in the waterway.

3.3.2 Fixed marks are indicated below:

(a) Right-hand side

Colour: red

Form: post with topmark

Topmark: red cone, point downwards

Light (when fitted): rhythmic red light

4.F

(fig. 3.5)

(b) Left-hand side

Colour: green

Form: post with topmark

Topmark: green cone, point upwards

Light (when fitted): rhythmic green light

5.F

(fig. 3.6)

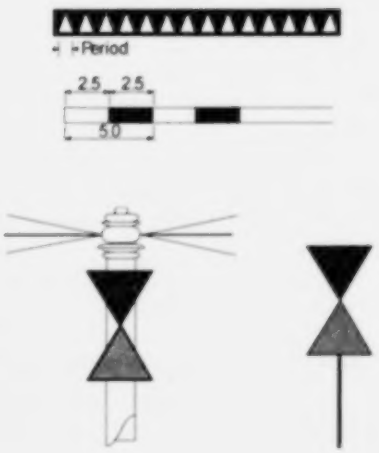
(c) Bifurcation

Colour: red/green

Form: post with topmark

Topmark: red cone, point downwards, above a green cone, point upwards

Light (when fitted): continuous scintillating white light or isophase white light (may be the group-flashing white light a group of three flashes)



6.A 6.B

(fig. 3.7)

The above cones may be replaced by triangular panels with a white background and a red or green border.

3.3.3 Secondary arms of the waterway, mouths of waterways and entrances to harbours

On the approach to secondary arms of the waterway, to mouths of waterways and to harbour entrances, the bank walls on both sides of the waterway may be marked as far as the head of the dividing mole by the fixed marks described in 3.3.2. (a) and (b). Vessels entering the harbour are regarded as upstream traffic.

3.3.4 Buoys are described below:

(a) Right-hand side

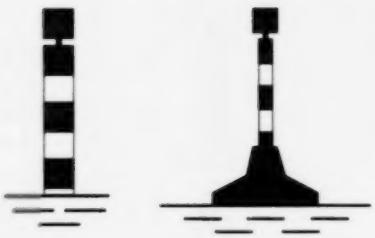
Colour: horizontal red and white bands

Form: spar-buoy or spar

Topmark: red cylinder

Light (when fitted): rhythmic red light

Generally with radar reflector



1.F1 1.F

(fig. 3.8)

(b) Left-hand side

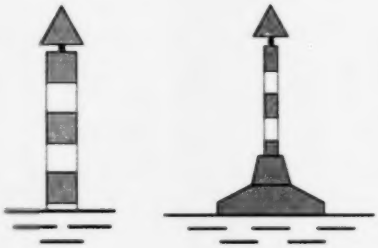
Colour: horizontal green and white bands

Form: spar-buoy or spar

Topmark: green cone, point upwards

Light (when fitted): rhythmic green light

Generally with radar reflector

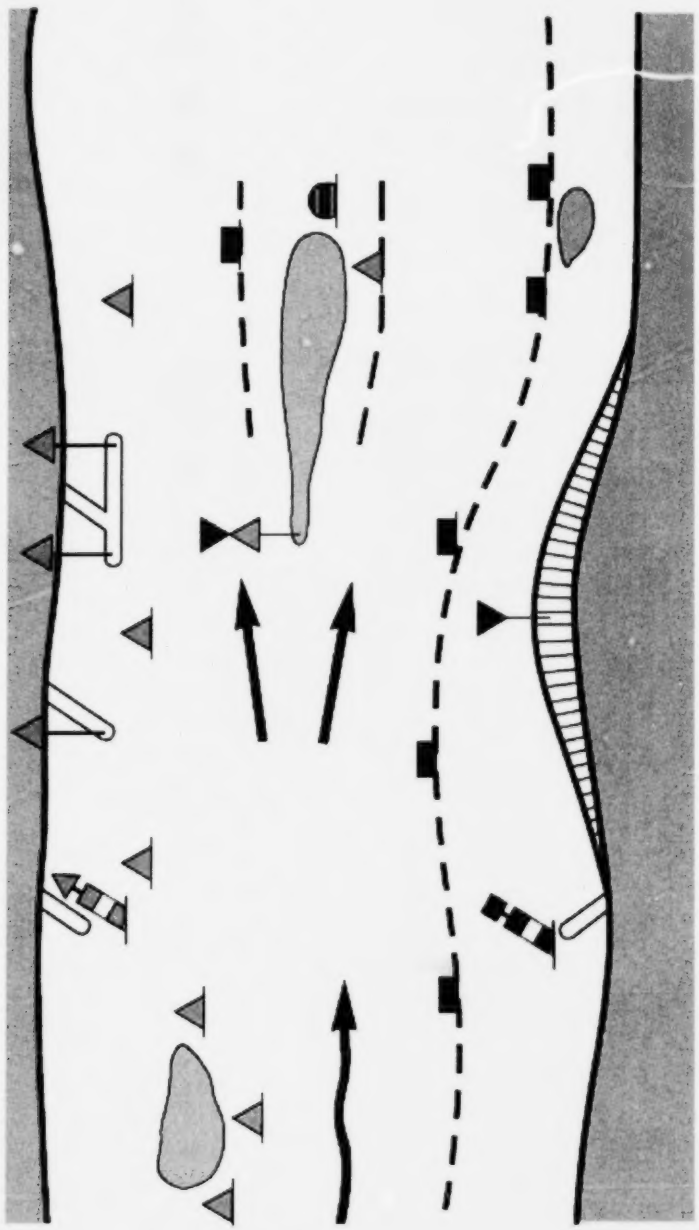


2.F1 2.F

(fig. 3.9)

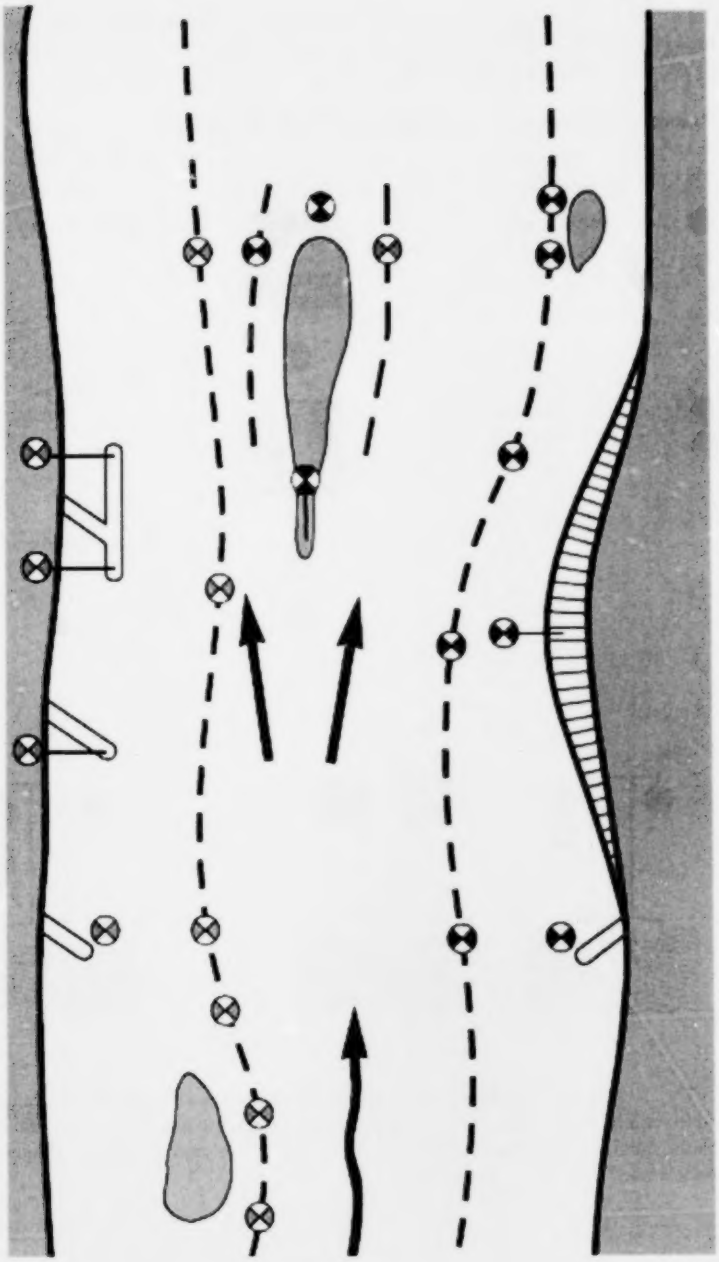
3.3.5 Examples of using the signs in paras. 3.3.2-3.3.4 are given in figures 3.10 and 3.11.

Examples: By day



(fig. 3.10)

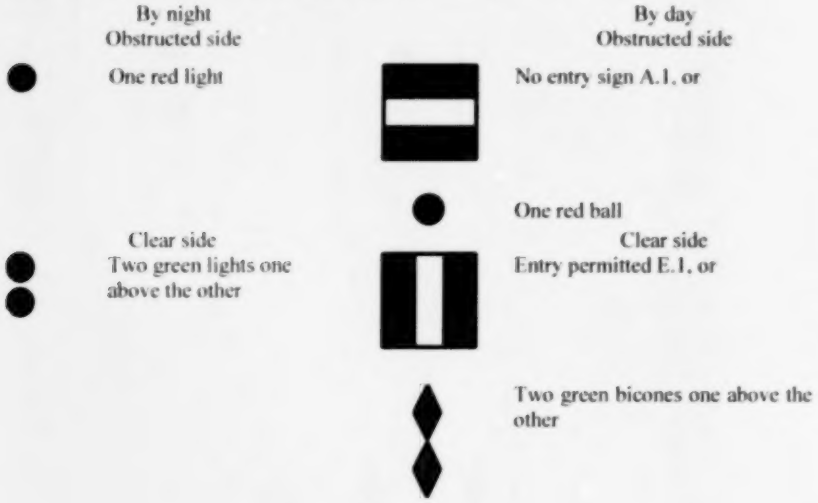
By night



(fig.3.11)

3.3.6 Where it is desired to draw attention to the obstacles and danger points and to prescribe only the side on which vessels must pass, the following marking (which may be placed on auxiliary craft) shall be used.

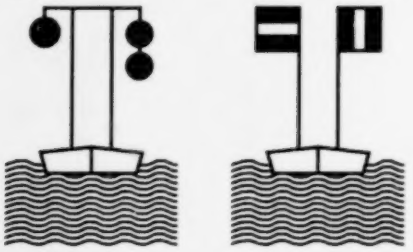
Passage permitted on the clear side without reducing speed



(fig. 3.12)

Examples:

By night



By day

(fig. 3.12a)

3.3.7 Where it is desired both to draw attention to such obstacles and danger points and to require vessels under way to reduce speed in order to avoid causing wash, the flags, boards, balls or lights shown below shall be used; they may be placed whether on the obstacle itself or on an auxiliary craft.

Passage permitted on the clear side at reduced speed (avoid creating wash)

By night	By day
Obstructed side	Obstructed side
One red light	One red flag or red board
Clear side	Clear side
One red light above one white light	One red flag or board above one white flag or board.or

(fig. 3.13)

Examples:

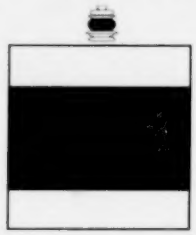
(fig. 3.13a)

3.4 Bank marks indicating the position of the fairway

3.4.1 Bank marks indicating the position of the fairway in relation to the banks

These signs indicate the position of the fairway in relation to the bank and, together with the buoyage of the waterway, mark the fairway at points where it approaches a bank; they also serve as landmarks.

(a) Fairway near the right bank



4.A With light

4.B Without light

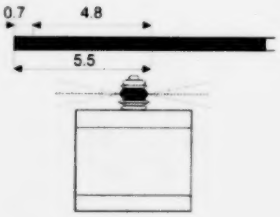
(fig. 3.14)

Colour: red/white

Form: post with topmark

Topmark: square boards (sides horizontal and vertical), red, with two horizontal white stripes

Light (when fitted): rhythmic red light



(b) Fairway near the left bank

5.A With light

5.B Without light

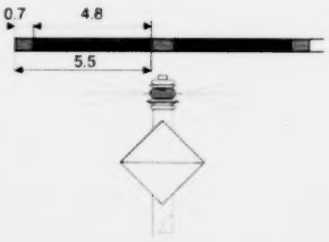
(fig. 3.15)

Colour: green/white

Form: post with topmark

Topmarks: square board (diagonals horizontal and vertical), upper half painted green and lower half white

Light (when fitted): rhythmic green light

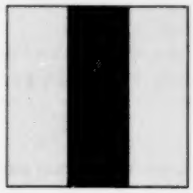


3.4.2 Marking of cross-overs

Marking of cross-overs indicate at what point the fairway passes from one bank to another and also give the axis of this cross-over:

(a) Right bank

4.C With light



4.D Without light

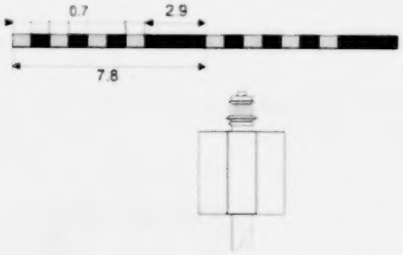
(fig. 3.16)

Colour: yellow/black

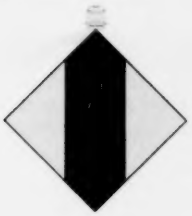
Form: post with topmark

Topmarks: square yellow board (sides horizontal and vertical), with a central vertical black stripe

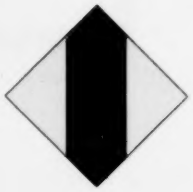
Light (when fitted): yellow light, flashing or occulting, with an even-number characteristic other than the group-flashing rhythm with a group of two flashes



(b) Left bank



5.C With light



5.D Without light

(fig. 3.17)

Colour: yellow/black

Form: post with topmark

Topmark: square yellow board (diagonals horizontal and vertical), with a central vertical black stripe

Light (when fitted): yellow light, flashing or occulting, with an odd-number characteristic other than the group-flashing rhythm with a group of three flashes

3.5 Buoyage and marking of lakes and broad waterways

Main navigation signs

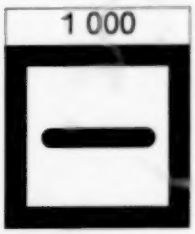
3.5.1 The main navigation signs are given in annex 7 to CEVNI. The signs with their minimal dimensions are given in Appendix 1.

Auxiliary navigation signs

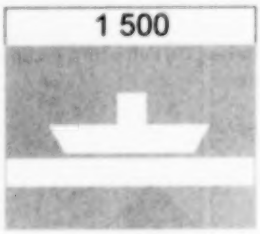
3.5.2 The main signs may be supplemented by the following auxiliary signs:

(a) Panels showing the distance at which the regulation applies or the special feature indicated by the main sign is to be found. The panels are placed above the main sign.

Examples:



In 1,000 m, stop



In 1,500 m, ferry-boat not moving independently

(fig. 3.18)

(b) Additional luminous signal

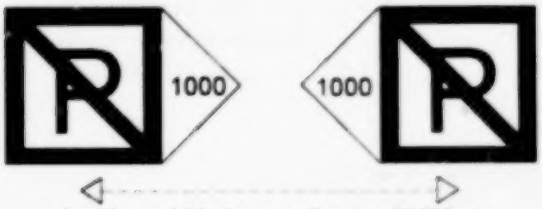
Additional luminous signals are given in Section 4.4.

(c) Pointers showing the direction of the section to which the main sign applies.

Note: The pointers need not necessarily be white and may be placed beside or below the main sign.

Examples:

Berthing permitted



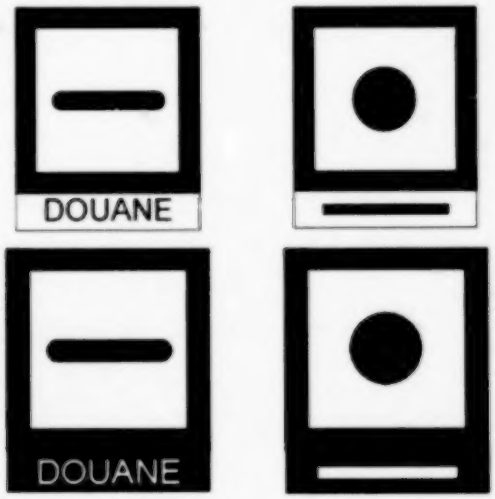
Berthing prohibited (over a distance of 1,000 m)

(fig. 3.19)

(d) Panels giving explanations or additional information

Note: These panels are placed below the main sign

Examples:



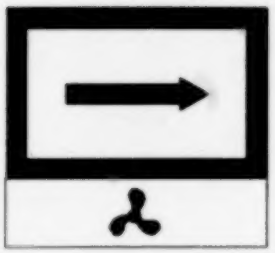
Stop for Customs Give one long blast

(fig. 3.20)

(e) Panels indicating the type of craft concerned

Where a prohibition, a mandatory requirement or an indication applies only to a particular type of craft or activity, the symbol for such craft or activity shall be shown in black on a white ground on a panel below the sign.

Example:



Mandatory requirement for motorized craft
to take a specified direction

(fig. 3.21)

3.6 Additional marking for navigation by radar

3.6.1 Yellow floats with radar reflectors are placed upstream and downstream from piers.

8.C 8.C1

(fig. 3.22)

3.6.2 Pole with radar reflector is placed upstream and downstream from bridge piers.

8.C2

(fig. 3.23)

3.7 Buoys for miscellaneous purposes

3.7.1 Buoys required for purposes other than those referred to above shall be predominantly white, to avoid confusion with red, green or yellow buoys. They may carry pictograms.

3.8 Warning posts

3.8.1 In special cases where it is necessary to set up warning posts (e.g. on winding sections of waterway where the visual range is limited), the competent authorities shall determine the signals to be given by such posts so far as possible on the basis of the present SIGNI, and in such a way as to avoid confusion or conflict with the signals described in them.

4 Buoyage and marking of lakes and broad waterways

4.1 General

4.1.1 Subject to the exception referred to in 3.2.3, the provisions of Sections 3.2 to 3.4 shall apply to lakes and broad waterways. However, additional marks, taken from the IALA Aids to Navigation system may be used, if required:

- marking of danger points, obstacles and special features: cardinal marks, isolated danger marks, marking of new dangers;
- safe water marks;
- special marks for marking of prohibited or restricted zones;
- weather signs and signals on lakes.

4.1.2 In addition, danger points, obstacles and special features may be marked by other electronic means, such as automatic identification system (AIS).

4.1.3 If the competent authorities consider the risk to navigation to be especially high, at least one of the marks should be duplicated. Any duplicate mark shall be identical to its partner in all respects.

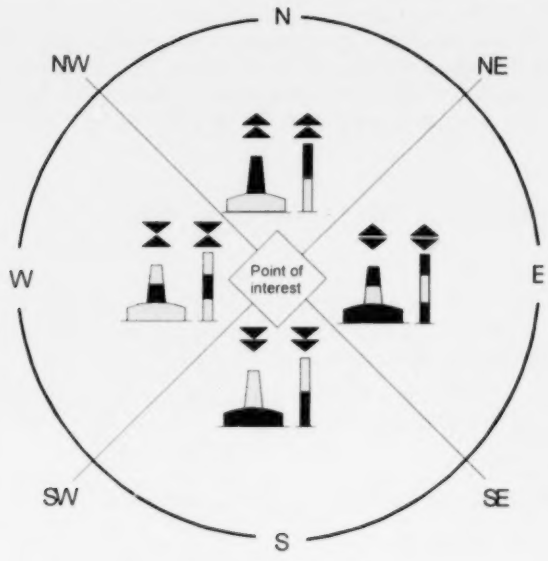
4.2 Marking of danger points, obstacles and special features

4.2.1 Cardinal marks

The four quadrants (North, East, South and West) are bounded by the true bearings NW-NE, NE-SE, SE-SW, SW-NW taken from the point of interest.

A cardinal mark is named after the quadrant in which it is placed.

The name of a cardinal mark indicates that the mark should be passed on the side of the quadrant named.



(fig. 4.1)

North cardinal mark

Topmark: two black cones, one above the other, points upward

Colour: black above yellow

Form: pillar or spar, with topmark

Light (when fitted):

Colour: white

Rhythm: continuous quick scintillating or continuous scintillating

South cardinal mark

Topmark: two black cones, one above the other, points downward

Colour: yellow above black

Shape: pillar or spar, with topmark

Light (when fitted):

Colour: white

Rhythm: group quick scintillating or group scintillating, with a group of six flashes followed by a long flash of not less than two seconds duration

East cardinal mark

Topmark: two black cones, one above the other, base to base

Colour: black with a single broad horizontal yellow band

Form: pillar or spar, with topmark

Light (when fitted):

Colour: white

Rhythm: group quick scintillating or group scintillating, with a group of three flashes

West cardinal mark

Topmark: two black cones, one above the other, point to point

Colour: yellow with a single broad horizontal black band

Form: pillar or spar, with topmark

Light (when fitted):

Colour: white

Rhythm: group quick scintillating or group scintillating, with a group of nine flashes

A cardinal mark may be used for example:

- to indicate that the deepest water in that area is on the named side of the mark;
- to indicate the safe side on which to pass a danger;
- to draw attention to a particular feature in a fairway such as a bend, a junction, a bifurcation or the extremity of a shoal.

4.2.2 Isolated danger marks

An isolated danger mark is a mark erected on, or moored above an isolated danger which has safe water all around it.

Colour: black with one or more broad horizontal

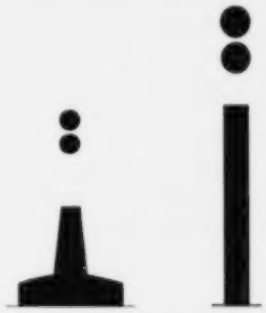
Form: any (generally pillar or spar) with topmark

Topmark: two black spheres, one above the other

Light (when fitted):

Colour: white

Rhythm: group flashing (group of two flashes)



8.D 8.D1

(fig. 4.2)

4.2.3 Marking of new dangers

The term "New Danger" is used to describe newly discovered hazards not yet shown in nautical documents. New Dangers include naturally occurring obstructions such as sandbanks or rocks or man-made dangers such as wrecks.

Colour: Blue and yellow vertical stripes in equal number dimensions (minimum 4 stripes and maximum 8)

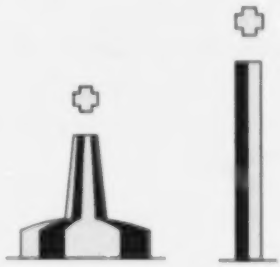
Form: pillar or spar

Topmark (if any): vertical or perpendicular yellow cross

Light (when fitted):

Colour: yellow/blue alternating

Rhythm: one second of blue light and one second of yellow light with 0.5 seconds of darkness between



8.G 8.G1

(fig. 4.3)

4.3 Marking of the axis of a channel, the middle of a channel or a landfall

4.3.1 Safe-water marks

Safe water marks serve to indicate that there is navigable water all round the mark; these include centre line marks and mid-fairway marks. Such a mark may also be used as an alternative to a cardinal or lateral mark to indicate a landfall.

Colour: red and white vertical stripes

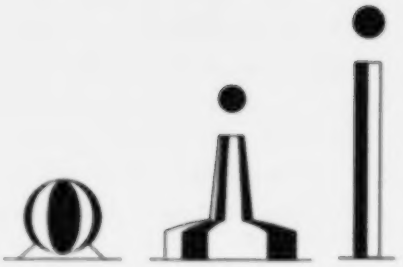
Form: spherical buoy or pillar or spar with topmark

Topmark (if any): single red sphere

Light (when fitted):

Colour: white

Rhythm: isophase, single-occulting, one long flash every 10 seconds or Morse code "A"



8.E 8.E1 8.E2

(fig. 4.4)

4.4 Special marks

Marks not primarily intended to assist navigation but which indicate a special area or feature referred to in appropriate documents, such as military exercise zone marks, recreation zone marks.

Colour: yellow

Shape: optional, but not conflicting with navigational marks

Topmark, if any: single yellow, "X" shape

Light (when fitted):

Colour: yellow

Rhythm: any, other than those described in 4.2, 4.3 and 4.5

8.F 8.F1

(fig.4.5)

4.5 Weather signs and signals on lakes

4.5.1 "Caution" warning

A yellow light producing about 40 flashes per minute constitutes a "caution" warning.

The "caution" warning indicates the probable onset of a dangerous phenomenon without specifying the time thereof.

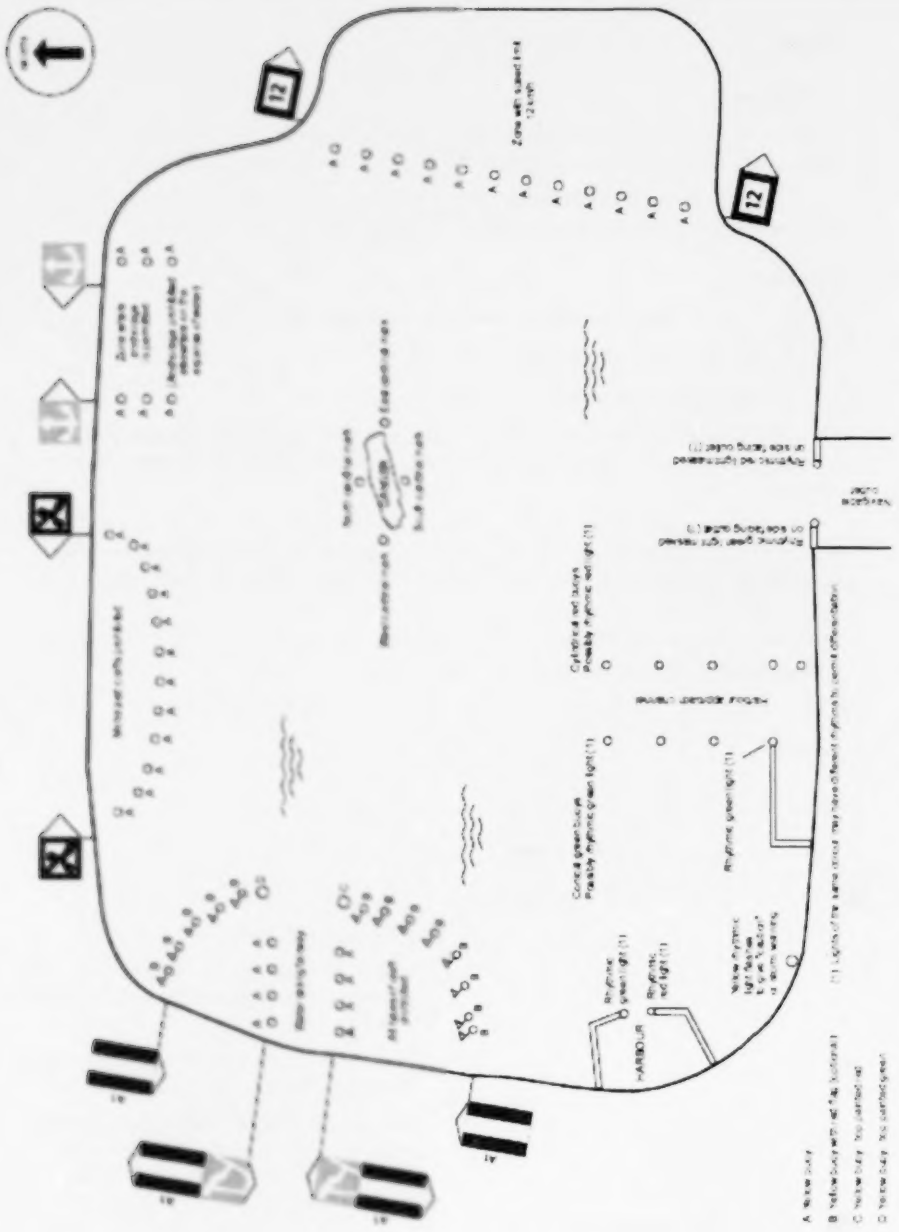
4.5.2 "Imminent danger" warning

A yellow light producing about 90 flashes per minute constitutes a "danger" warning.

The danger warning indicates the imminent arrival of a dangerous phenomenon.

4.6 Example of signs and signals on lakes and broad waterways

Fig. 4.6 illustrates the provisions of this section for lakes and broad waterways.



(fig. 4.6)

5. Lights

5.1 Definitions

5.1.1 The terms "white light", "red light", "green light", "yellow light" and "blue light" mean lights of colours according to the provisions referred to in Appendix 2.

5.1.2 The terms "scintillating light" and "quick scintillating light" mean rhythmic lights flashing 40-60 times per minute and 100-120 times per minute.

5.2 Fixed lights

5.2.1 The basic principle of marking by fixed lights is as follows:

- A fixed red light means "Stop";
- A fixed green light means "Go ahead".

The meaning of the other marks comprising red or green lights derives from that principle. In particular, a fixed red light combined with other lights means either "Stop" or "Caution".

However, since green lights are always placed at the side of the waterway or fairway, vessels must never steer towards a green light. It has therefore been found necessary to provide for another signal authorizing passage towards which vessels may steer: a yellow light.

Pairs of lights should form a visual angle of not less that 5' (tan 5' = 0.00145) to distinguish them from one another.

5.2.2 The meaning of the signals given by fixed lights is given in table 5.1.

Table 5.1

Numbering	*Signal*	*Description*	*Meaning*
		A. Prohibitory signs	
A.1c		Single red light	"No passage" This signal shall apply: Either to some of the fairways or arms of the waterway (prohibited fairways under bridges, prohibited arms, etc.). Or to the whole of the waterway (stoppage of navigation, locks, etc.). The use of this signal shall be limited to cases where a single red light is sufficient to indicate the intended prohibition clearly. In other cases, the use of two or more red lights is recommended (see below)
A.1b		Two red lights placed one above the other (a pair)	Complete and prolonged stoppage of navigation (blockage of waterway, bridges or locks out of service, etc.)
A.1d		Two red lights placed side by side (a pair)	Complete but brief stoppage of navigation. This signal shall always be operable as required (movable bridges, locks, narrow fairways, etc.)

Numbering	*Signal*	*Description*	*Meaning*
A.11c			Extinction of one of the red lights means: "Passage forbidden (passage about to be authorized)"
A.9b		A red light above a white light	"Do not cause wash"
A.11a		A red light and a green light placed side by side (a pair) or a red light above a green light	"No passage now but stand by to go ahead"; This signal is always operable as required
	or		
A.11b			
		B. Mandatory signs	
B.10		Two isophase yellow lights placed one above the other (a pair)	Vessels proceeding on the main waterway must, if necessary, change course and speed to allow vessels to leave harbours or tributary waterways
		D. Recommendatory signs	
D.2b		Two green lights set apart	"Go ahead between the lights"
D.1b		Single yellow light	"Go ahead, but look out for traffic coming the other way". Vessels may steer towards the yellow light, which is placed above the navigable fairway
D.1f		A pair of yellow lights (placed one above the other, or, if necessary, side by side), alone or between green lights	"Go ahead; traffic in the opposite direction is prohibited". Vessels may steer towards the yellow lights, which are placed above the fairway
	or		
D.1e			
D.3b		A fixed white light and an isophase white light placed side by side (a pair)	"You are recommended to steer towards the side showing the isophase light". Signal to be used, for example, on the approach to a double lock
		E. Informative signs	
E.1b		Single green light	"Go ahead" (the green light is always placed at the side of the fairway). The use of this signal shall, however, be restricted to cases where a single green light is sufficient clearly to indicate the clear passage In other cases, the use of two green lights set apart and indicating the passage is recommended
E.1c		Two green lights placed side by side (a pair)	"Go ahead" (this signal is always placed at the side of the fairway). It is always operable as required, the permission to pass being limited in time

Numbering	*Signal*	*Description*	*Meaning*
E.1d		Two green lights placed one above the other (a pair)	"Go ahead" (this signal is always placed at the side of the fairway). This signal may be used in particular cases (lock out of service with all gates open)
E.12:		One or two white lights:[2]	"Difficulty ahead — Stop if the regulations so require"
E.12a		Fixed light(s): advance signal	Examples: Lock closed, vessel navigating in the opposite direction
	or		
E.12b			
E.12c		Isophase light(s): advance signal "You may proceed"	Examples: Lock open, no vessel navigating in the opposite direction
	or		
E.12d			

Note 1. Each fixed red, green or yellow light may be replaced by a red-white-red, a green-white-green or a yellow board respectively, as provided below in Chapters 8 and 9.

Note 2. Single fixed white lights shall not be used except as advance signals. Fixed white lights must be used with care as they may be confused with other white lights (for instance, public lighting).

5.3 Rhythmic lights

Rhythmic lights are described in Sections 3.2-3.4, Chapter 4 and Appendix 4.

5.4 Additional luminous signal

Additional luminous signal is a luminous white arrow combined with certain lights from Section 5.2. The signal relates to the direction of navigation shown by the arrow.

(fig. 5.1)

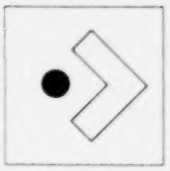
Examples: On a main waterway, at the entrance to a basin, this signal means:

(a) With green light

Permission to enter the basin to which the arrow is pointing

(b) With red light (fig. 5.2)

No entry to the basin to which the arrow is pointing



(fig. 5.3)

5.5 Semaphores

5.5.1 In special cases where a semaphore is required to regulate navigation (e.g. in harbours), the competent authorities shall determine the signals to be given by the semaphore in such a way as to avoid any confusion or conflict with the signals described in the present provisions.

5.5.2 The competent authorities shall preferably choose a signalling system using red and green lights, operable as required.

6 Installation of signs and marking in characteristic sections of the river

6.1 General

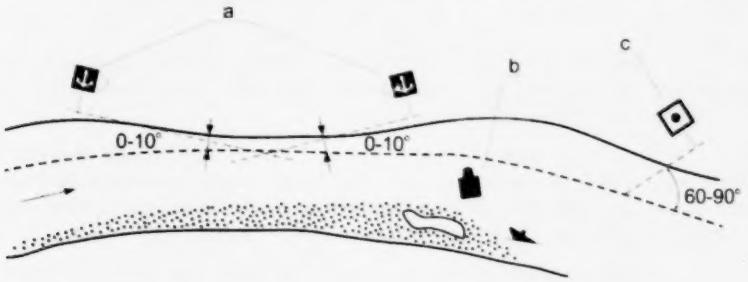
6.1.1 Signs have two possible orientations, namely:

(a) Parallel to the axis of the fairway;

(b) Perpendicular to the axis of the fairway.

6.1.2 Signs of the type mentioned under 6.1.1(a), are predominantly prohibitory or indicative signs, and are placed on the side of the fairway to which the prohibition or the indication applies.

Bank marks which are used in relation to navigation in both directions (upstream and downstream) shall be oriented as under 6.1.1(a). In some cases, (better visibility) the angle between the mark and the axis of the fairway can be 10° or less (fig. 6.1, sign *a*).



(fig. 6.1)

6.1.3 Most signs are positioned as described under 6.1.1 (b), and generally do not apply to one side of the fairway only. These signs are erected at right angles to the axis of the fairway so that they are visible to a user when under way.

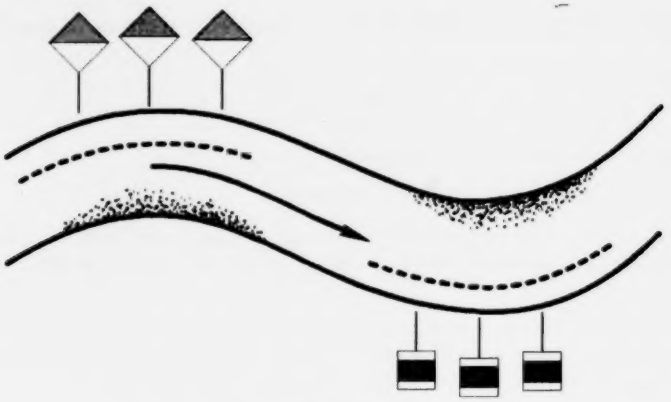
Bank marks which are used in relation to navigation in one direction (upstream or downstream) shall be oriented as under 6.1.1 (b). In some cases, (better visibility) the angle between the mark and the axis of the fairway cannot be less than 60° (fig. 6.1, sign *c*).

6.1.4 The use of a particular floating sign or bank mark and how it is installed depends on the one hand on the local features of the river (speed of current, variation in levels, meanders, width of the river bed, existence of sills, branches, islands, etc.), and on the other hand on the density of traffic in a given sector and the form and size of convoys.

6.1.5 The position of each floating sign indicating the side of the fairway shall be determined on the basis of the marking plan based on the results of measurements. Depths within the limits of the width of the marked fairway shall under no circumstances be less than the minimum depth reported for the sector in question.

6.1.6 When floating signs are installed, it is essential to take the direction of the current into account. If the current flows in the direction of a navigational hazard (obstacle), the sign or signal shall always be placed a long way from it; if, on the other hand, it flows in the opposite direction, the sign or signal shall be placed nearer.

6.1.7 An example of the installation of the marks indicating the position of the fairway is given in fig. 6.2.



(fig. 6.2)

6.1.8 Obstacles on the sides of the fairway are always marked with floating signs. When the obstacle is indicated by a single sign, it shall be placed on the upstream extremity of the obstacle, on the fairway side (fig. 6.1, sign *b*).

6.1.9 As a rule, lighted buoys or unlighted buoys shall be used to mark the upstream and downstream extremities of sills, banks which narrow the fairway in meandering sectors, banks protruding into the fairway, piles of stones, reefs, water supply engineering structures, and underwater hazards or obstacles (sunken vessels, anchors, etc.).

6.1.10 Marker posts and spars shall be used as additional signs supplementing buoys in order to give a clearer indication of the limits of the fairway over difficult sills and in order to mark underwater obstacles. In some cases and in some sectors, buoys may be replaced by marker posts or spars.

6.1.11 In order to avoid damage to buoys during the period when ice is carried down, they shall be replaced by spars or marker posts.

6.1.12 On sectors of the river where there is day and night navigation, forks, junctions and the axis of the fairway, along with obstacles to navigation lying within the

fairway, shall be marked by light buoys or bank marks and lights. Floating signs shall be installed at such a depth and at such a distance from the obstacle that the safety and ease of movement of vessels shall be guaranteed at night and in poor visibility.

6.1.13 On sectors where the river bed is narrow, preference shall be given to bank marks.

6.1.14 Each bank mark shall be established following reconnaissance of the area and selection of the most appropriate site. The need to ensure the visibility of the sign whatever the level of the water should be taken into consideration.

6.1.15 Where it is necessary to ensure good visibility of the symbol on the sign over a long distance, both for vessels proceeding upstream and vessels proceeding downstream, two boards may be installed on the sign pole at an angle to each other, one pointing upstream and the other downstream.

6.1.16 In selecting the site of bank mark, account shall be taken of the need to ensure easy maintenance and to protect it against ice and flooding.

6.1.17 Before a bank sign or signal is installed, the depth in the area in front of it and in the direction it indicates shall always be measured.

6.1.18 As a general rule, the objective is that only the network of bank marks shall provide an uninterrupted indication of the position of the fairway as a whole, while the floating signs shall help boatmasters to determine the limits of the fairway.

6.2 Marking of meandering sectors

Installation of cross-over marks and bank lights

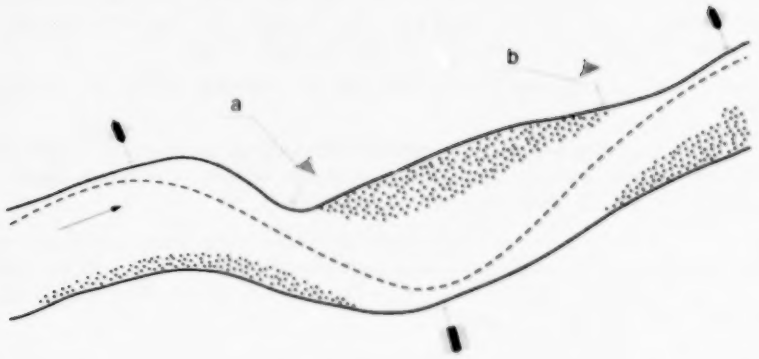
6.2.1 Cross-over marks and bank lights may be used in meandering sectors in order to indicate that the fairway crosses over from one bank to the other (signs featured in 4.C, 4.D, 5.C, 5.D in 3.4.2).

6.2.2 Cross-over marks and bank lights are placed when the fairway is sufficiently broad, its safety is ensured, and when the direction only requires to be indicated approximately.

6.2.3 Bank lights and cross-over marks shall be selected in such a way as to differentiate cross-overs in terms of their length, in other words in terms of the distance between two neighbouring signs. The length of the cross-over is relative, since it depends on the width of the fairway.

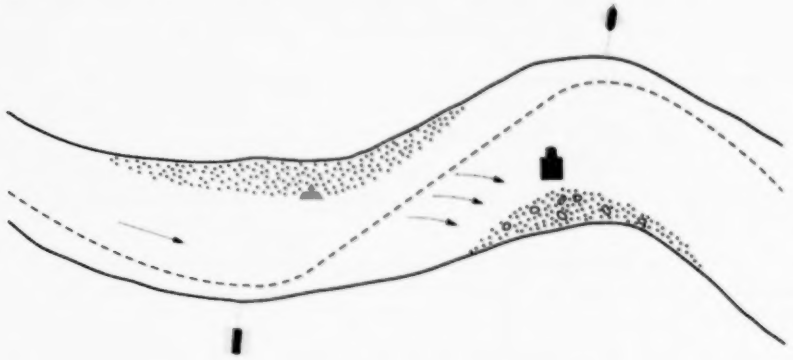
6.2.4 Cross-over marks and bank lights have best results on distances up to 3 km. On such sections, cross-over marks and bank lights (without floating signs) can be placed under conditions where the available width for navigation is more than two times wider than the minimum prescribed width of the fairway for a particular sector. If the available width for navigation is less than the minimum prescribed width of the fairway for a particular sector, cross-over marks and bank lights (without floating signs) cannot be placed at distance greater than 1-1.5 km.

6.2.5 If the distance between two neighbouring cross-over marks is larger than the calculated visibility, and when the fairway passes close to the bank, the bank mark with light, which additionally marks the position of the fairway, is placed between those two neighbouring cross-over marks (fig. 6.3, sign *a*). The bank mark with light is also placed when the fairway passes near the bank (fig. 6.3, sign *b*).



(fig. 6.3)

6.2.6 In case the direction of the current makes an angle with the fairway, when strong side winds or a similar situation occurs, the fairway can be marked by additional navigation marks according to the local conditions (fig. 6.4).

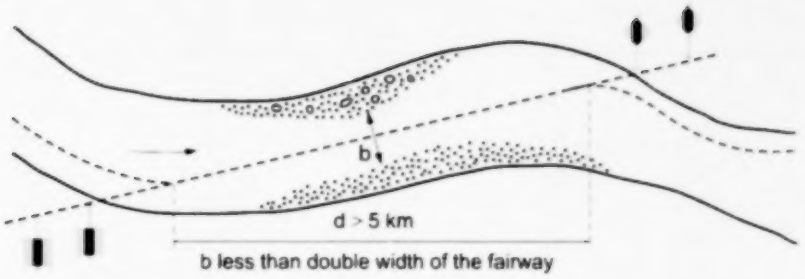


(fig. 6.4)

6.2.7 When the fairway follows the middle of the river bed over a long distance or when it crosses abruptly from one bank to the other, its axis may be indicated by a pair of cross-over marks on each side of the fairway, as shown in fig. 6.5.

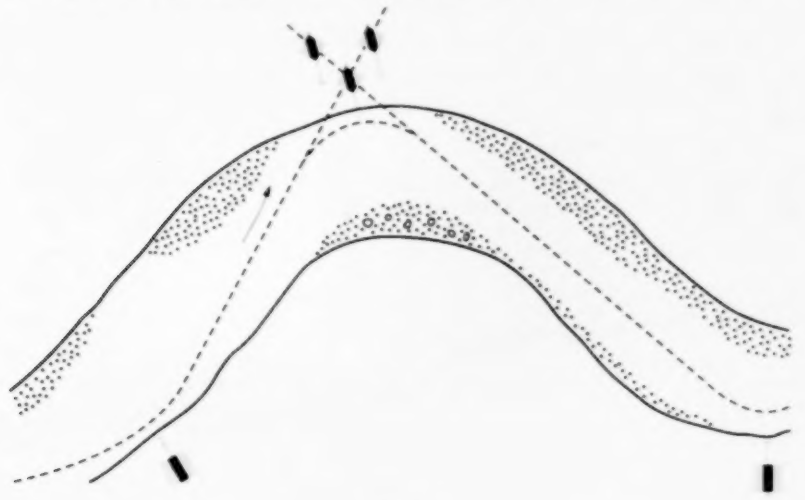
The advantage is given to two cross-over marks on each side of the fairway in case of straight-line sections longer than 5 km, where the available width for navigation is less than double the width of the minimum prescribed width of the fairway for a particular sector. In that case and when the bank configuration allows so, the cross-over marks are placed on both margins of the transition (fig. 6.5).

It is always preferable to have two cross-over marks on each side of the fairway when the fairway is narrowed by certain obstacles constituting threats to navigation or other hazards marked by floating signs.



(fig. 6.5)

6.2.8 In sectors where the fairway, after moving to the opposite bank, abruptly crosses to the other bank, three cross-over marks (the front shall have two boards) must be placed (fig. 6.6). In this case, lights of the back cross-over marks shall be oriented strictly on the axis of the fairway, one upstream and the other downstream.



(fig. 6.6)

6.2.9 Interrelationships of the front and back marks at hidden routes shorter than 4 km are presented in Table 6.1.

Table 6.1

l (m)	*d (m)*	h_o *(m)*	*a (m)*	*2a (m)*
200	17	8.50	2.6	5.0
300	25	8.70	4.0	8.0
400	33	8.85	5.2	10.5
500	42	9.00	6.5	13.0
600	50	9.10	8.0	16.0
700	58	9.20	9.0	18.0
800	67	9.35	10.0	20.0

L (m)	*d* (m)	h_0 (m)	*a* (m)	2*a* (m)
900	75	9.50	12.0	24.0
1 000	83	9.60	13.0	26.0
1 500	125	10.25	19.0	38.0
2 000	166	10.90	26.0	52.0
2 500	207	11.50	33.0	66.0
3 000	250	12.15	39.0	78.0
3 500	290	12.75	46.0	92.0
4 000	330	13.40	52.0	104.0
> 4 000	760	14.20	25.0	50.0

Where (see fig. 6.7):

L (m) — maximal distance when cross-over marks can be used;

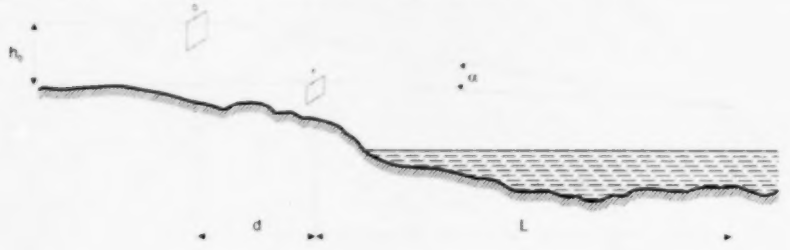
d (m) — distance between front and back signs (is approximately 1/12 *L*);

h_0 (m) — height between lights of front and back mark;

a (m) — distance necessary for a vessel to adjust its course if the vessel does not go along the cross-over;

α (°) — viewing angle.

Table 6.1 also assumes that the observer's sight is 5 m above the water level, and the light of the lower (front) sign is 8 m above the water level.



(fig. 6.7)

Value *a* describes accuracy of the route and it is of significance while navigating through a narrow fairway. Accuracy is, in principle, increased by approaching the cross-over marks.

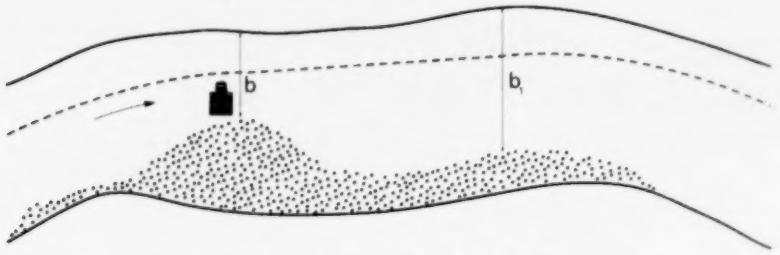
To ensure proper recognition of cross-over marks and their lights, the viewing angle α cannot be less than 4 angular minutes in relation to the vertical.

Installation of floating signs

6.2.10 In meandering sectors, where the fairway passes along the middle of the river bed, or along the bank or passes slowly from one bank to the other, floating signs are used to mark formations in the river bed or obstacles, both natural and artificial, on the sides of the fairway (banks, shores, islands, stones, sunken vessels, wrecks of bridges, etc.), when these obstacles protrude into the fairway and reduce its width (fig. 6.8).

These underwater obstacles are marked in meandering sectors by floating signs if, within the limits of width indicated above, the depth of water over such obstacles does not exceed the minimum depth reported for the sector. If the obstacle is not very wide, a

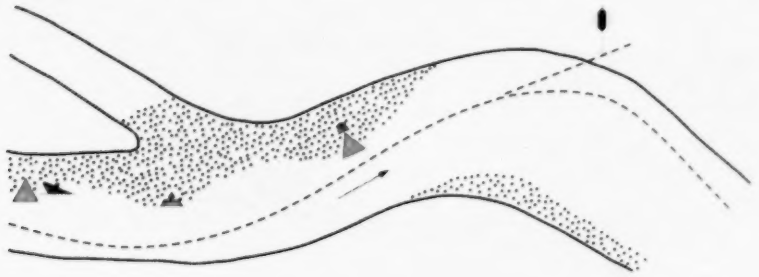
floating sign with light shall be installed on its upstream section. A marker post or a spar may be installed on its downstream section, depending on its length.



b < double width of the fairway b1 > double width of the fairway

(fig. 6.8)

6.2.11 Floating signs marking underwater obstacles of considerable length are installed in such a way that the parts situated closest to the fairway are marked by light signals between which unlighted signs are placed, thus enabling a given obstacle to be marked completely (fig. 6.9).



(fig. 6.9)

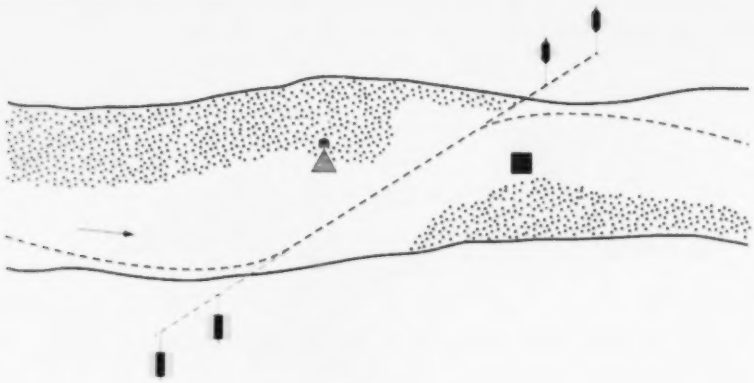
6.2.12 In the parts of the river bed where the shore opposite that followed by the fairway is bordered by an inshore bank which favours upstream navigation in calm water, the bank is marked by floating signs independently of the width of the river bed.

6.2.13 In meandering sectors the bank marking system in periods of high water generally remains the same as in periods of lowest water level, except in sectors where, when water levels are high, it is advisable to find another fairway with better navigational features. In this case, the selected fairway shall be marked appropriately.

6.3 Marking of shoals

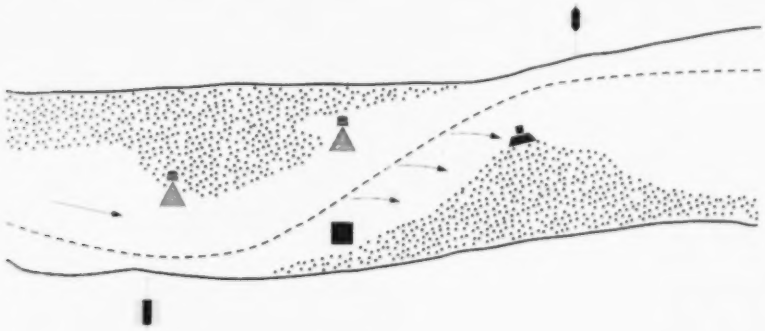
6.3.1 In shoals, as in other sections, the principle of the continuous marking of the direction of the fairway shall be applied. In shoals the fairway can be marked by cross-over marks, bank marks and floating signs.

6.3.2 Alternately located shoals may also be marked by cross-over marks, with sufficient available width for navigation in which vessels are passing in a straight line (fig. 6.10).



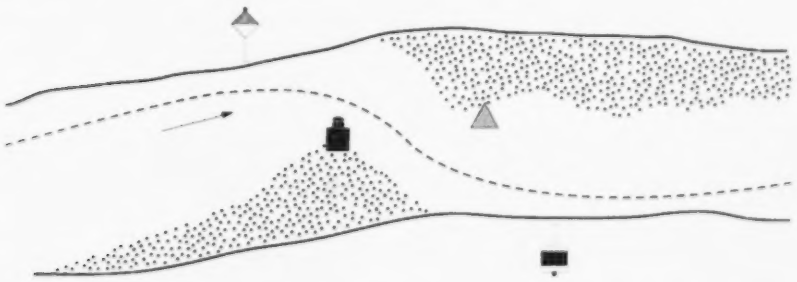
(fig. 6.10)

6.3.3 A fairway passing over shoals is usually marked by floating signs (figures 6.10 and 6.11).



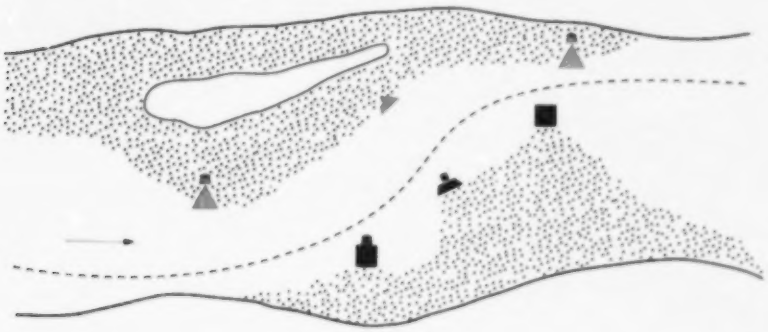
(fig. 6.11)

6.3.4 If the fairway passes in a straight line between sandbars, reaching far into the river bed, it is necessary to place at least two floating signs at the entry and the exit of such a section: one at the top of the upstream and one on the top of the downstream sandbar (fig. 6.12).



(fig. 6.12)

6.3.5 If the fairway is curved in the section between sandbars, it is necessary to place additional floating signs (fig. 6.13).



(fig. 6.13)

6.3.6 Additional floating signs shall also be placed on the entry and exit of rugged sections with sandbars, which also characterize the side streams.

6.3.7 In case the application of cross-over marks is impossible, the fairway across a shoal may be marked only by floating signs, on one or both sides, depending on the width of the fairway and hydrological conditions.

6.4 Marking of the vicinity of bridges and passages through bridges

6.4.1 The navigation of vessels and convoys in the vicinity of bridges and through bridge passages requires particular attention and precautions on the part of boatmasters because of the narrow fairway. These sections must therefore be marked with the greatest care.

6.4.2 The basic condition to be met to ensure safe passage through bridges is the marking of the direction of the fairway and also, where necessary, its sides. Floating signs and bank marks may be used in addition to boards and lights for marking the navigable passage through bridges.

6.4.3 The choice and positioning of the marking signs depends in each case on local conditions in the bridge section.

6.4.4 The installation of marking signs in the vicinity of bridges and the buoying of navigable passages shall comply with the following conditions:

(a) In order to indicate permission to use the navigable passage of a bridge, only signs A.10, D.1 or D.2 from annex 7 to CEVNI shall be used;

(b) The installation of marking signs shall be based on depth and current direction measurements, both in the immediate vicinity of the bridge and in the approach sections;

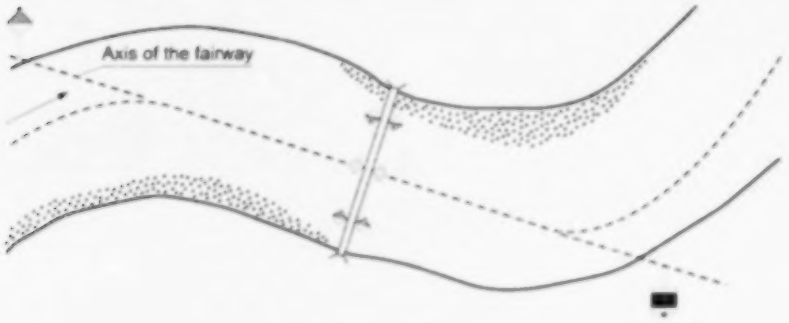
(c) The positioning of the signs installed in the vicinity of a bridge shall be modified in due course, as conditions of navigation change;

(d) If, when approaching the bridge or the navigable passage, the direction of the current forms an angle with the bridge, giving rise to eddies around the pillars of the bridge, the floating signs shall be so installed as to indicate the direction of the eddies.

6.4.5 Floating signs may be installed at the approach to the navigable passage to give an exact indication of the position of the fairway.

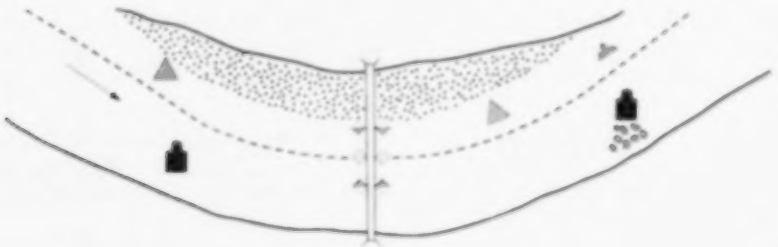
6.4.6 The following examples show the placement of the aforementioned signs marking the section near bridges:

(a) If a bridge is in a meandering section of the river, the direction of vessels passing through the bridge passages may be marked by bank marks (fig. 6.14):



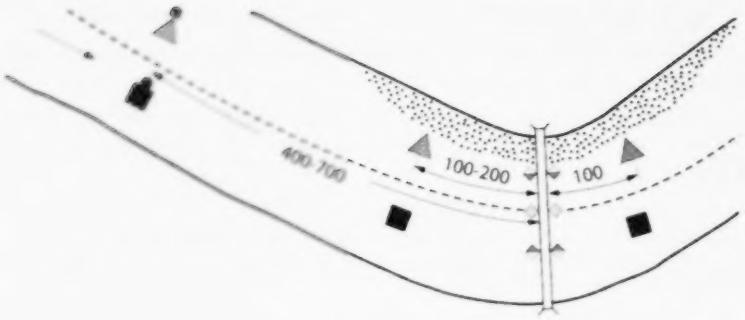
(fig. 6.14)

(b) If, due to a larger curvature of the fairway or for some other reasons, marking by the aforementioned signs is not possible, floating signs (buoys, etc.), placed in order to follow the river flow, may be used (fig. 6.15):



(fig. 6.15)

(c) If the bridge is positioned on the section where the current makes an angle with the axis of the navigable passage, marking may be done by two pairs of buoys upstream of the bridge. One pair of buoys is placed at a distance of 100 m-200 m upstream of the bridge, and a second pair, 400 m-700 m upstream of the bridge. Buoys further away from the bridge are placed in such a way that, in combination with the pair of buoys closer to the bridge, they mark the river flow. Another pair of buoys may be placed downstream of the bridge at a distance of 100 m from the bridge (fig. 6.16).



(fig. 6.16)

6.5 Installation of floating signs restricting berthing points

6.5.1 Where there is increased intensity of vessels' traffic and the substantial accumulation of vessels in inner harbour basins of ports, not only bank marks should be used in order to restrict berthing places but also floating signs.

6.6 Reference numbers on buoys and marker posts

6.6.1 On buoys and marker posts the use of alphanumeric characters and capital letters is recommended. Where both letters and figures are used, their heights should be the same. Where two such combinations occur, as on junction markers, a hyphen should be used.

6.6.2 Characters should not be less than 200 mm high, white on red or green buoys, or black on yellow buoys.

6.6.3 The characters on a lighted buoy can be black on a white background. Signs are usually affixed to special nameplates. It is recommended that the characters be displayed on both sides of buoys.

7 Marking of harbour entrances

7.1 In this Chapter, the expression "entrances to harbours" also includes entrances to tributary waterways, entrances to secondary arms of waterways and entrances to docks.

7.2 If day marking at the harbour entrance is necessary, the entrance shall be marked:

- To port of a vessel entering: by painting the light pillar, preferably cylindrical, red; or by means of a cylindrical red topmark; or by painting red rectangles on the jetty;
- To starboard of a vessel entering: by painting the light pillar, preferably conical, green; or by means of a conical green topmark; or by painting green triangles, point upwards, on the jetty.

7.3 At night, for small harbours, it shall be sufficient to illuminate the day markings described above. If lights are considered necessary, the entrance shall be marked:

- To port of a vessel entering: by a red light, preferably rhythmic;
- To starboard of a vessel entering: by a green light, preferably rhythmic.

In the case of a narrow or specially shaped entrance, one of these lights may be sufficient to help a boatmaster to enter the harbour. Such a single light shall be rhythmic.

Fig. 4.6 illustrates the provisions of this section for lakes and broad waterways.

7.4 The same rules shall apply to the colours and shapes of buoys and marks on fairways leading into the harbour.

It is recommended that lights of the same colour used for signalling the entrance to the harbour and buoying the fairway should have different rhythms to permit differentiation.

The installation of the above lights for marking the entrance to the harbour does not preclude the installation of fixed lights having the meaning attached to them in Chapter 5, with a view to regulating navigation. In such cases, the lights marking the entrance to the harbour shall be rhythmic.

8 Marking of permanent structures

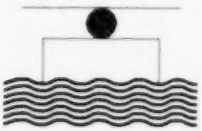
8.1 General principle

The following may be replaced:

Each fixed red light	●	by a rectangular red board with a horizontal white stripe
Each fixed green light	●	by a rectangular green board with a vertical white stripe; and
Each fixed yellow light	○	by a square yellow board with the diagonals horizontal and vertical

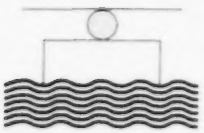
8.2 Fixed bridges

8.2.1 Fairway strictly prohibited

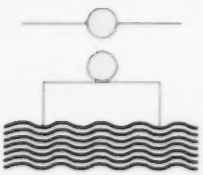


(fig. 8.1)

8.2.2 Fairway recommended



Two-way traffic



One-way traffic (in this case the other face of the bridge must display a red light);

If necessary for practical reasons, the lights may be placed side by side

(fig. 8.2)

To mark the width of the fairway by showing the site of the piers, or if appropriate, to show the boundaries between which the fairway is normally usable (e.g. where the depth of water or headroom near the piers is insufficient), the following marks may be used as desired:

D.2a

or

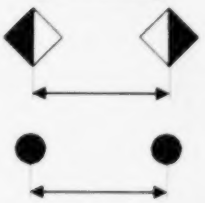
D.2b

Mere recommendation to vessels to keep between the limits indicated

A.10a

or

A.10b



Passage prohibited outside the limits indicated

For the convenience of boatmasters, inverted scales showing the headroom available under the bridge may be affixed to the piers.

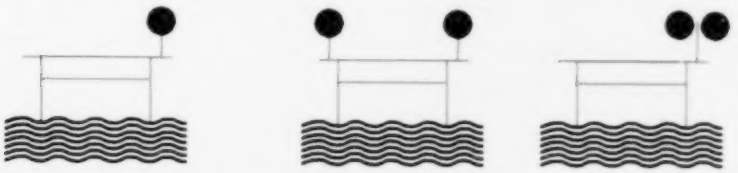
8.2.3 Fairway not expressly recommended

Where there are one or more recommended fairway, fairways which, while not expressly recommended, may be used at the boatmaster's own risk shall either bear no marking or exhibit the restrictive signs prescribed under Subsection C "Restrictive signs", Section 2.1, Appendix 1 as well as Section C of annex 7 to CEVNI.

8.3 Movable bridges

8.3.1 Passage prohibited

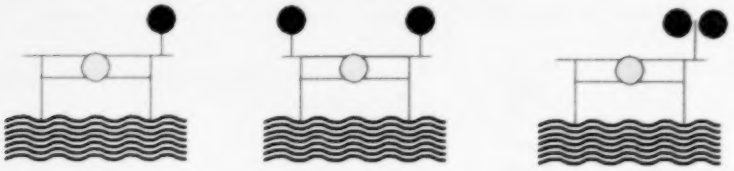
(a) General prohibition



(fig. 8.3)

Where there are several red lights side by side the extinction of one of them means: "Passage prohibited (movable bridge being prepared for opening)."

(b) No passage except for low-built vessels



(fig. 8.4)

(c) Bridge out of service

(fig. 8.5)

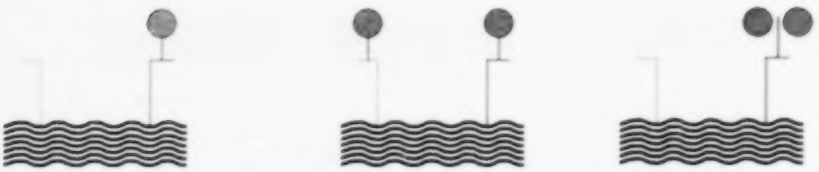
(d) "No passage now; but stand by to go ahead" (passage will shortly be clear).

(fig. 8.6)

The lights can be placed either side by side or one above the other.

8.3.2 Passage authorized

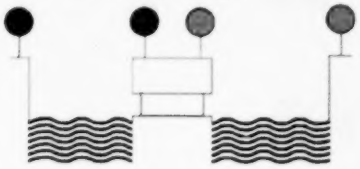
(a) General authorization



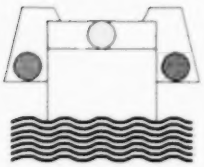
(fig. 8.7)

(b) Special cases:

(i) swing bridge



(ii) lift-bridge



The following may be used:

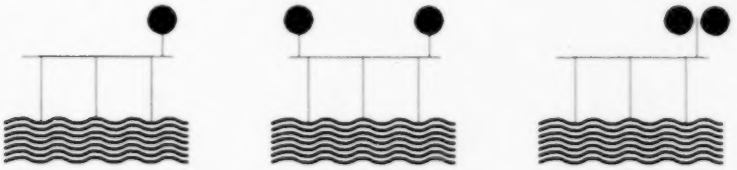
- green lights; or
- yellow light; or
- green lights combined with yellow light

(fig. 8.8)

8.4 Locks

8.4.1 Entry or exit prohibited

(a) General prohibition



(fig. 8.9)

Where there are several red lights side by side, the extinction of one of them means: entry or exit forbidden (gates being prepared for opening).

(b) Lock out of service

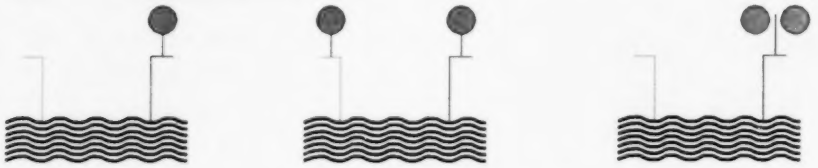
(fig. 8.10)

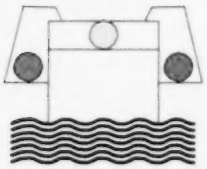
(c) "Stand by to proceed" (entry or exit will shortly be authorized)

(fig. 8.11)

The lights may be placed either side by side or one above the other.

8.4.2 Entry or exit authorized





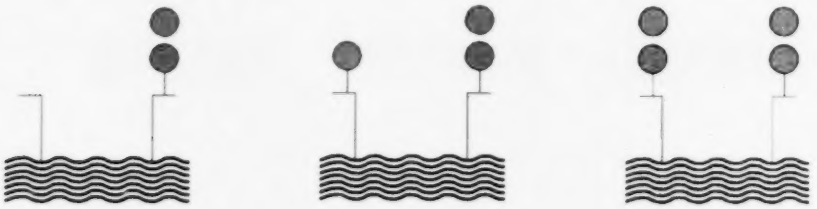
Special case: lifting gate

The following may be used:

- green lights; or
- yellow lights; or
- green lights combined with yellow light

(fig. 8.12)

8.4.3 Passage clear: lock with all gates open



(fig. 8.13)

9 Blockage of the waterway

9.1 General principle

The following may be replaced:

Each fixed red light by a rectangular red board with a horizontal white bar

Each fixed green light by a rectangular green board with a vertical white bar; and

9.2 Complete and protracted stoppage of navigation

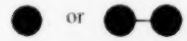
A.1b In general

A.1c However, a single red light may be used if it is sufficient clearly to indicate the prohibition and cannot be confused with lights extraneous to the waterway marking lights

A.1f or A.1e In case of emergency, red flags may be used provisionally by day pending marking with the lights or boards prescribed above

9.3 Temporary stoppage of navigation

This situation arises, for example, when passage through a narrow section of the waterway is authorized in each direction alternately. The signals are then operable as required.

 "Stop"

A.1c A.1d

Stand by to "proceed"

A.11a A.11b

"Go ahead"

E.1b E.1c

Where there are several red lights side by side, the extinction of one of them means: "Passage forbidden (passage about to be authorized)".

The lights may be either side by side or one above the other.

10 Marking of prohibited or restricted zones

10.1 If the limits of prohibited or restricted zones need to be indicated, the special marks prescribed in paragraph 4.4 shall be used. The nature of the prohibition or restriction shall so far as possible be notified to users in writing (for instance, in charts) and by local information.

This information shall preferably be given by means of boards on the bank showing one of the prohibitory or informative signs prescribed in Appendix 1 and annex 7 to CEVNI, or by means of the red rectangular board with a white horizontal bar. Such boards shall if necessary be supplemented by an arrow showing the direction of the area to which the sign prescribed in paragraph 3.5.2 (c) applies.

10.2 Alternatively, the local information may be carried on the yellow buoys mentioned in paragraph 4.4. It may also be given by means of topmarks placed on the buoys instead of

a topmark as prescribed in paragraph 4.4. For example, buoys at the edge of a zone where navigation is totally prohibited may carry a staff with a rigid triangular red pennon. If other topmarks are used, they shall be clearly different from this red pennon and from the topmarks prescribed in Sections 3.2-3.4.

10.3 If a shore zone in which one or more types of craft or activity are prohibited or restricted is crossed by a fairway in which one such kind of craft or activity is not prohibited or restricted (except as regards an entrance to a harbour to which Section 3.2 applies), the sides of the fairway also shall be marked by yellow buoys. The two buoys at the entrance shall be twice the size of the other buoys, and if necessary their upper parts shall be painted red on the right- hand side and green on the left-hand side for a boatmaster leaving the fairway.

10.4 On the bank, boards as prescribed in Subsection E "Informative signs", Section 2.1, Appendix 1 as well as Section E of annex 7 to CEVNI shall indicate the type of craft or activity permitted (e.g., the "water skiing" permission sign to indicate a water-skiing fairway across an area where all navigation, or only water skiing, is prohibited); the markings may be supplemented by the arrow prescribed in paragraph 3.5.2 (c).

10.5 Where a zone open for more than one activity is crossed by a fairway in which only one activity is permitted, the sides of the fairway shall be marked as in the above case. If possible, a board on the bank shall indicate the activity permitted.

10.6 Fig. 4.6 illustrates the provisions of this section as applied to lakes and broad waterways.

11 Variable message signs to regulate traffic

11.1 When variable message signs are used to regulate traffic, attention must be paid to the following:

(a) If variable message signs regulating traffic show images of signs from annex 7 to CEVNI, the images must be depicted using a mechanical display system. Appendices 1 and 3 are applicable with regard to colour selection and dimensions;

(b) By night, mechanical display systems shall be externally lighted. Appendix 5 may be applicable;

(c) The use of auto-illumination display systems should be avoided for the signs in annex 7 to CEVNI. Inverse representation (e.g. inversion of black and white surfaces for prohibitory signs) shall not be allowed;

(d) A remote controlled auto-illumination matrix display may constitute a reasonable alternative in order to indicate frequently changing information, such as water levels and the height of navigable passages through bridges. Technically, it is possible to display images using light emitting diodes, liquid crystals and light guides;

(e) By day, there must be sufficient luminosity to ensure the sign can be read; by night, luminosity must be reduced in order to prevent any dazzling and to ensure that the sign can be identified. The image must thus be regulated according to light measurements in the surroundings.

11.2 Examples of variable message signs to regulate traffic are contained in Appendix 6.

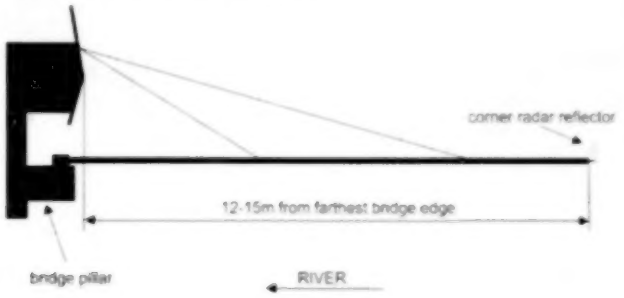
12 Installation of radar reflectors

12.1 Installation of radar reflectors on marking signs and signals and navigable passes through bridges

12.1.1 It is important to equip floating signs and bank marks with radar reflectors to ensure their visibility.

12.1.2 When marking signs equipped with radar reflectors are installed, account must be taken of the furthest distance between the vessel and the sign in terms of the perception of the sign on the radar screen. This distance depends on the technical characteristics of the radar equipment, the reflective capacity of the radar reflectors and the specific conditions of the river and the height of the antenna installed on the vessel, as well as the height of the radar reflector, both in relation to the water surface.

12.1.3 Since the visibility of bridge pillars is usually insufficient on radar screens, the bridge pillars for the passage of vessels upstream and downstream must be marked either by buoys equipped with radar reflectors placed not less than 15-20 m before the bridge, or by radar reflectors installed on the bridge itself not less than 12-15 m from the farthest edge of bridge construction (fig. 12.1). A sketch of the recommended radar reflector is contained in section 3.4 of appendix 1.



(fig. 12.1)

12.1.4 Since the radar reflector improves navigation safety, every effort should be made to install them by means of supports on the framework of bridges to mark the navigable passage through the bridge.

12.1.5 Navigational hazards and water supply engineering structures (sunken vessels, groynes, cross-beams, etc.) located in the river bed may also be marked by signs equipped with radar reflectors. If the groynes or cross-beams marked by radar reflector signals are located along one of the banks while the fairway follows the opposite bank, which is low and flat, the radar reflector signals may also be placed on that bank so as to facilitate the orientation of vessels navigating by radar.

12.1.6 When radar reflectors are used on marking signs and signals, the visibility of the sign must not be diminished. Their colour shall also correspond to the colour of the sign in question.

12.1.7 Radar reflectors on fairway buoys are most often manufactured using two vertical metal plates set as a cross, with a horizontal metal plate intersecting them at a right angle. The reflectors should be made of aluminium or stainless steel.

12.1.8 Practical experience has shown that there is a need for at least two standard sizes of reflectors on floating signs. Recommended dimensions are as follows:

- Type 1: tip to tip height 420 mm;
- Type 2: tip to tip height 850 mm.

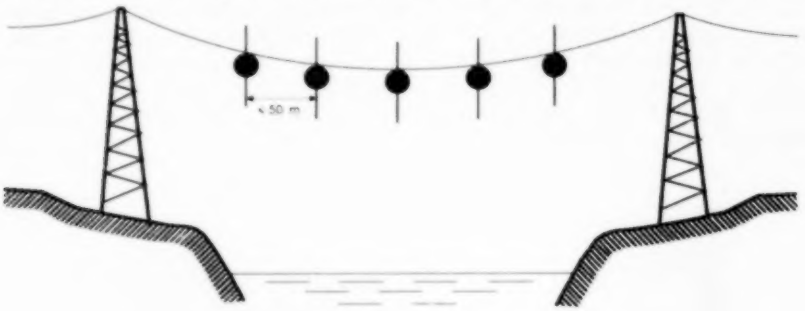
12.1.9 The square plate referred to in paragraph 12.1.7 has a diagonal of 300 or 600 mm respectively and sides of 210 or 425 mm respectively.

12.2 Buoys and poles with radar reflectors

12.2.1 Examples of buoys and poles with radar reflectors are given in Section 3.6.

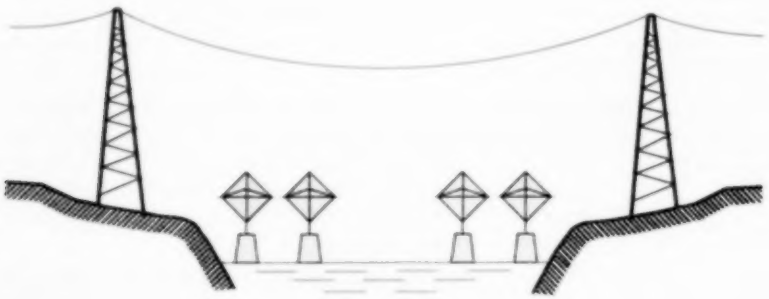
12.3 Marking of overhead cables (where applicable)

12.3.1 Radar reflectors secured to the overhead cable (giving a radar image of a series of points to identify the overhead cable) are shown in fig. 12.2.



8.C3
(fig. 12.2)

12.3.2 Radar reflectors placed on yellow floats arranged in pairs near each bank (each pair giving a radar image of two points side by side to identify the overhead cable) are shown in fig. 12.3.



8.C4
(fig. 12.3)

13 Monitoring of signs and marking by AIS aids to navigation

13.1 Function of AIS Aids to navigation

13.1.1 AIS AtoN is designed for displaying navigation signs and marks on electronic navigation charts. A special type of AIS station (AtoN AIS) fitted to an AtoN provides a reliable identification and visualization of the AtoN on board. In addition, this equipment can provide information and data that would:

- complement or replace an existing aid to navigation, providing identity, state of "health" and other information to surrounding ships or back to a shore authority;
- provide the position of floating aids (mainly buoys) by transmitting an accurate position to monitor if they are on station;
- provide real-time information for performance monitoring, with the connecting data link serving to remotely control changes in AtoN parameters or switching on back-up equipment;
- gather data AIS fitted shipping traffic for future aid to navigation planning purposes.

13.1.2 The use of AIS as an AtoN can provide the following services to AIS equipped vessels:

- Provide identification of the AtoN in all weather conditions;
- Complement existing signals from AtoN;
- Transmit accurate positions of floating AtoN;
- Indicate if a floating AtoN is off position;
- Mark or delineate tracks, routes, areas, and limits;
- Provide additional AtoN capability through use of virtual AIS AtoN where installation of physical AtoN is technically or economically difficult;
- Indicate AtoN status; and
- Provide an accurate position for fixed AtoN.

13.2 Types of AIS Aids to Navigation

13.2.1 Real AIS AtoN is an AIS station located on an AtoN that physically exists.

13.2.2 Synthetic AIS AtoN is where the AtoN message is transmitted from a remote AIS station for an AtoN that does physically exist.

13.2.3 Virtual AIS AtoN is transmitted as an AIS AtoN message for an AtoN that does not physically exist. When a virtual AIS AtoN is used, the AtoN symbol or information would be available for presentation to a boatmaster on an electronic chart, even though there is no real AtoN such as a buoy or beacon.

14 Regional and national special requirements

(left void)

Appendix 1

Minimal dimensions of the signs from annexes 7 and 8 of the European Code for Inland Waterways*

Appendix 2

Properties of lights**

Appendix 3

Colours of reflected light for navigation signs***

Appendix 4

Rhythmic lights****

Appendix 5

Recommendations for the lighting of traffic signs*****

Appendix 6

Examples for variable-message traffic signs******

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* It is proposed to reproduce here the text of Appendix 1 to Resolution No. 59, revision 2 (ECE/TRANS/SC.3/169/Rev.2).

** It is proposed to reproduce here the text of Appendix 2 to Resolution No. 59, revision 2 (ECE/TRANS/SC.3/169/Rev.2).

*** It is proposed to reproduce here the text of Appendix 3 to Resolution No. 59, revision 2 (ECE/TRANS/SC.3/169/Rev.2).

**** It is proposed to reproduce here the text of Annex 1 d to Resolution No. 22, revision 2 (ECE/TRANS/SC.3/108/Rev.2).

***** It is proposed to reproduce here the text of Annex 1 d to Resolution No. 22, revision 2 (ECE/TRANS/SC.3/108/Rev.2).

****** It is proposed to reproduce here the text of Annex 1 d to Resolution No. 22, revision 2 (ECE/TRANS/SC.3/108/Rev.2).